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Advertisement Index, see page xliv. *Official Notices, see Sup. 32*

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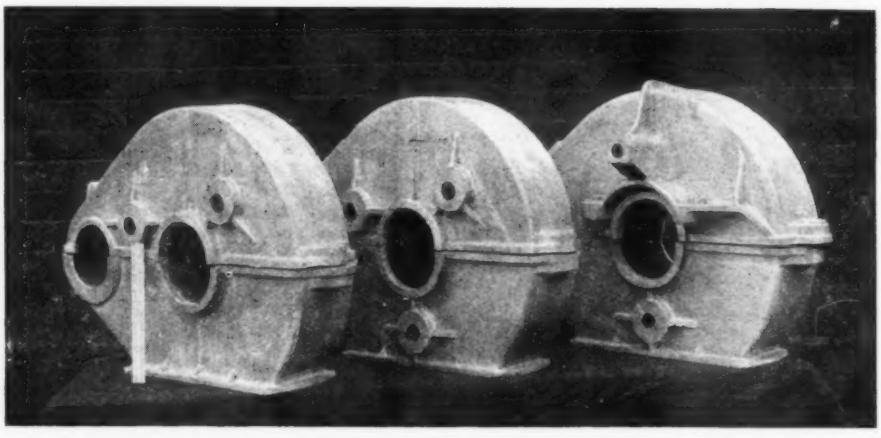

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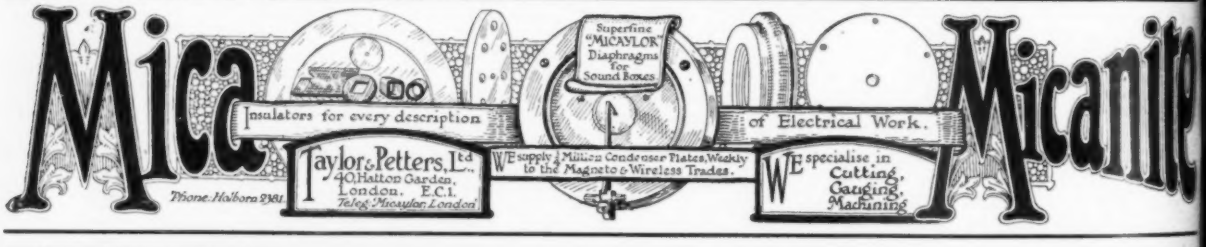
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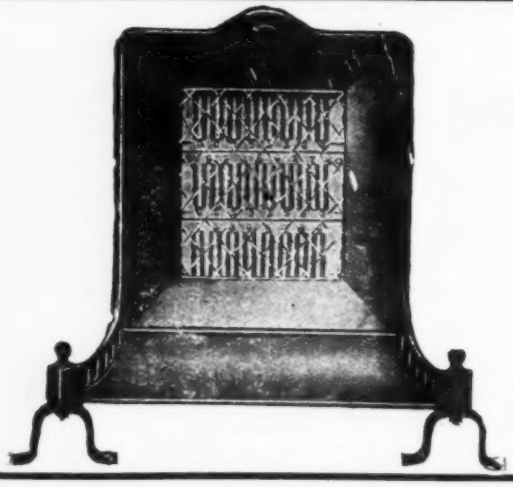

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LIST OF FOREIGN AGENTS (see first page "Official Notices").

Contents:

	PAGE
The Government's Electrical Policy	201
The Future of British Export Trade	202
The Trade Position in Spain	203
Canadian Leaders Looking Ahead	203
The World Power Conference at the British Empire Exhibition (*continued*)	204
Notes on Electric Lifts (*concluded*)	207
The I.E.E. Regulations for the Electrical Equipment of Buildings, by Donald Smeaton Munro	209
The London and Home Counties Electricity District Order	211
Correspondence—	
Hindrances to Electrical Development	212
Pulverised Coal	212
Electricity *v.* Gas	212
The Ordinary Member of the I.E.E.	213
The Retail Wireless Trade	213
Electrically-driven Centrifugal Pumps for Town Water Supply from Deep Wells	213
Insulating Tape	213
Business Notes	213
Lighting and Power Notes	216
The Post Office Research Station (*illus.*)	217
The Cotton Textile Exhibit at the British Empire Exhibition (*illus.*)	220
Tramway and Railway Notes	222
Telegraph and Telephone Notes	222
Radio Notes	223
Contracts Open and Closed	223
Notes	224
Our Personal Column	225
New Companies Registered	226
Official Returns of Electrical Companies	226
City Notes	226
Stocks and Shares	227
Market Quotations for Chemicals and Metals	228
Some of the Exhibits at Wembley (*illus.*)	229
A Yarrow Boiler Installation (*illus.*)	231
The South-East Lancashire Advisory Board	231
New Electrical Devices, Fittings, and Plant (*illus.*)	232
Parliamentary	233
Tramway Employes' Wages	235
Legal	235
Published Specifications	236
Contractors' Column	Advertisement page xxx

The Government's Electrical Policy.

THE Government's plans in respect of the development of electricity supply, railway electrification, and the necessary legislative and administrative measures were set out in a comprehensive way by the Chancellor of the Exchequer in moving the vote for the Ministry of Labour in the House of Commons on July 30th.

The particular interest of Mr. P. Snowden's statement for our readers centres in the exposition of the action already taken by the Government and its intentions for future action in respect of electrical developments. All sections of the electrical industry will welcome the proof that the importance of electrical development as a factor in the general prosperity and welfare of the country is officially recognised.

Mr. Snowden's references to railway electrification are not very hopeful. He recognises that the railways have some reason on commercial grounds for reluctance to embark on main line electrification, and he drew from this the political moral that nationalised railways, worked with the first object of serving the public interest, instead of conserving dividends, would be more enterprising. As railway nationalisation is not within the immediate or practicable programme of the present Government, all that he could say in this respect was that the Government was continuing to put all the pressure it could on the railways and had not given up hope of inducing them to do much more in the way of electrification.

On the question of the development of electricity supply, the Chancellor showed that administrative action has already been taken, and that the Government has set on foot inquiries for its guidance in taking other steps, including such legislation as may be found necessary.

The Severn barrage scheme is to be thoroughly investigated at the expense of the Treasury. This work will cost £95,000 and will occupy the engineers two or three years. It is recognised that the result may be unfavourable to the prosecution of the work.

An investigation of larger scope and more immediate promise is that of the steps necessary to revoke the

"parochial policy" of electricity generation and supply initiated by the Electric Lighting Acts of 1882 and 1888, and only slightly mitigated by the passing of the "emasculated" Act of 1919. The "parochial policy" has given us, Mr. Snowden said, 532 generating stations, of which 42 per cent. produced less than a million units each annually. The Government considers that the remedy is to provide a general system of high-pressure transmission lines throughout the country, fed from a comparatively small number of large generating stations. Existing undertakers, whether municipal or company, cannot be expected to find the necessary capital, and the Government will have to give financial assistance to a very considerable amount. It is apparently not yet decided whether the works will be owned and run as Government enterprises. The "greatest expert on electricity in this country" (as Mr. Snowden named him not, though worthy of so high a praise, it has been suggested that we should ask electrical readers to vote as to the "favourite") has been authorised to enter into negotiations with the municipalities and power companies with respect to this, and also with respect to the essential condition of the standardisation of frequency throughout the country. The Government will embark on the work of standardisation as soon as it receives the expert's report. This item contains a definite promise of a considerable amount of work in some directions, subject to the voting of the money.

For the better co-ordination of electricity supply, the Government considers that the Electricity Commissioners must have the fuller powers proposed by the 1919 Bill, and it proposes to introduce a Bill for that purpose at an early date It may be remembered that one of the features dropped at the last stages of the 1919 Bill was the establishment of District Electricity Boards, where the Commissioners decided such organisation to be necessary, which were to be the sole generating authorities in each district. The Chancellor paid a well-deserved tribute to the work done by the Commissioners with the limited powers they have. He thinks that both companies and municipalities have opposed that work and that the municipalities, frequently parochially minded, have been the greater sinners. The Government has decided then to face opposition of existing undertakers and to facilitate a national reorganisation of electricity supply on the lines recommended by the Williamson Committee, as did the Coalition Government in its 1919 Bill, with possibly some additional provisions for the construction of transmission lines.

Mr. Snowden expressed the Government's belief in the importance of developing supply in rural districts. It is recognised that rural electricity supply, by itself, cannot be self-supporting; but that by making use of the proposed transmission lines, cheap supplies can be given along the lines. This is borne out by experience in other countries. It is held out that rural supply will do something to check the flow of population from the country to the towns, and to encourage the transfer of industries into country districts. But the Chancellor went a little further in his ideas for the benefit of rural districts. He thinks that some State assistance may be needed for distribution, and that this may include hire-purchase arrangements for wiring and so forth.

It will be recognised that in the main the Government policy is that set out in the "Coal and Power" Report issued under the auspices of Mr. D. Lloyd George last month, which may be taken as the policy of the Liberal party in Parliament. It should, therefore, have the support of a majority in the House of Commons.

Until the Government tables its Bill, it is impossible to judge how far its proposals are calculated to effect the objects set out by the Chancellor and how far they will be acceptable to the supply industry. But it is intended to take the very sensible course of holding a conference under the Electricity Commissioners of the Associations representing the various sections of that industry, to see what can be agreed on, and what assistance from national funds will be required for the development of the proposed general transmission system. The Chancellor laid down the principle that the work to be assisted must be work which the existing undertakers cannot themselves finance, but which will, within not more than ten years, be self-supporting.

This proposal suggests that a considerable acceleration of electrical development may result, and that the Government is prepared to submit the necessary legislation and money votes to Parliament for the execution of the new work.

Of course, much depends upon the political situation. Mr. Snowden's speech suggests that if this subject can be lifted out of the cauldron of party politics, we shall have reached a time when one more opportunity will thus be given to the supply industry to show vision, capacity, and will to co-operate in a work of national importance, of permanent benefit to the productive capacity of the country. It is too much to hope that these qualities will be shown, and that the narrow jealousies of the "parochially minded" will be firmly and effectively suppressed?

The debate which followed Mr. Snowden's statement revealed no opposition to the general lines of the electrical development policy expounded. We doubt whether the House was ready immediately to grasp the proposals so as to intelligently discuss them. Some questions as to how far the policy would be one of nationalisation received the answer that it would depend upon circumstances. Mr. Lloyd George naturally said that the Government had adopted his "Coal and Power" pamphlet, and other speakers welcomed the prospect of getting something done, but, of course, the details of the Bills and financial proposals will determine how much opposition and criticism they will encounter. If the Government succeeds in getting a general agreement with the existing authorised undertakers, that should go a long way to ensure success.

It is unfortunate that electricity supply should be a subject of party politics, but it cannot develop as it should without Parliamentary action. No exception should be taken to the scheme by electrical men purely on the ground that a Labour Government has embodied in it the ideas of other Governments or other Parties. Electrical men are concerned to secure increased electrical efficiency of Britain and they will offer constructive criticism as necessary. They will indulge the hope that laymen will treat the subject similarly intending that the industry may be freed from its restrictive shackles.

The Future of British Export Trade.

In response to pressure from many directions, the Government has appointed a Committee to inquire into and report upon the conditions and prospects of British industry and commerce, with special reference to export trade, and to make recommendations with regard thereto. There has not been undue haste in announcing the names of the members of the committee and its terms of reference; nor can it be imagined from the terms of the memorandum describing the ground which the Government desires to have explored, that it will be possible to show any exceptional expedition in arriving at practical conclusions. Indeed, industry will do well to proceed energetically with any operations that it may have in progress for working out its own salvation, just as though there were no committee in existence, hoping for the economic conditions of the world to improve.

It is unlikely that the present Parliament will be in existence when such practical recommendations as may emerge can be reduced to the form of legislative enactment, and it is certain that the inquiry now ordered will bring no relief whatsoever during the coming winter. If there be any who consider it probable that the sittings of this committee will contribute in any way to increasing employment in British works in a short space of time he must be an optimist of a peculiar type. In the first place, though the collection of statistical and other material is being proceeded with in Government Departments, operations cannot seriously begin until after the holidays. In the second, the task that is set in the memorandum is so large as to involve investigations

which must extend over a long period—indeed, the wording suggests that the data to be compiled in next year's Census of Production will be needed. And in the third place the personnel of the committee suggests to some minds that even when all the necessary material from at home and abroad has been brought together, there may be interminable arguments between men who are strong on the theory and the practice of business respectively. Possibly in the end there may be not one unanimous report, but majority and minority statements as has so often happened in the past.

But while one must thus conscientiously state the facts and regard the committee as unable to afford any sort of immediate solution for any of our industrial and trade problems, it is unquestionable that such a committee is necessary if the nation is to have placed before it a complete statement of the new trade situation that has developed both here and overseas in recent years, together with certain thoroughly considered recommendations regarding what ought to be done in order to enable us to continue to provide an industrial and commercial livelihood with security and reasonable contentment for many millions of people. The movement in other lands for industrial production; hours and conditions of labour at home; the expectation of keener competition from the Continent as certain countries are enabled to feel their feet again; rates of wages, selling organisation and prices—these are a few of the big matters that cannot be side-tracked, for the terms of the reference are very wide indeed covering these and a host of other industrial and trade questions which have been discussed again and again in our pages. We record the Memorandum in our "Business Notice" pages to-day. The proceedings of the committee, if they contain a complete record and review of the whole subject, and if they can be kept free from bias and political prejudice, should form a most valuable document—one such as has never before been produced.

The Trade Position in Spain.

In the opinion of British authorities in Spain the industrial crisis there has probably reached its worst point, and commercial and industrial conditions are expected to improve from now onwards. It is recognised that Spanish manufacturers and traders will not be able effectively to contend against foreign competition in the principal markets, whatever recourse be had to changes in protective tariffs, unless their manufacturing methods become more efficient, and it seems that a supreme effort is to be made to secure that end. According to the British Commercial Secretary in Madrid (Captain U. de B. Charles), the iron and steel industries have been more active through the requirements of the railways. Belgium, France, Italy, and Germany have increased their export trade to Spain at the expense of the United Kingdom. It is still true that British manufacturers retain their high reputation for quality, but price to-day is the deciding factor. The Commercial Secretary advises the British manufacturer to make a supreme effort to reduce costs, but one may be pardoned for wondering whether prices would not have to be reduced to a very fine point indeed to penetrate the walls of trade obstruction in Spain. Electrical and allied engineering concerns know quite enough about this serious price difficulty in connection with their export trade. It is constantly before them. It has been referred to by directors in their reports to shareholders, by organisations in their representations to Governments, and by employers in their discussions with trade union delegates. One example of what is happening to hamper British electrical operations in Spain was recently mentioned in these pages. An order for machinery and electrical equipment was given to Germany at £80,000; the nearest British tender figured out at £128,000, owing to the issuance of some royal order which operated favourably to the Continental tenderer. Our operations are greatly hampered by the innumerable regulations that have been set up in the interests of Spanish industrial development, but somehow the situation seems to yield before Teutonic operators. A new Commercial Treaty between Germany and Spain was signed last week granting tariff reductions to Germany in exchange for most-favoured-nation treatment for Spanish products entering Germany. It is certain that there is no falling off in the activity of German agents in Spain, and it is reported that long before the signing of the new Treaty many goods of German manufacture were entering Spain through other countries and so avoiding payment of the extra depreciated exchange surcharge. Belgium is reported as a serious competitor to Spanish steel industries, notwithstanding all the obstacles, but Switerland, like ourselves, is stated to be finding Germany a serious competitor in dynamos and electrical apparatus.

Nobody can feel that the immediate prospect beyond the Pyrenees is such as to inspire hope in the breast of the British electrical trader.

Canadian Leaders Looking Ahead.

The most natural attitude for electrical men everywhere is one of looking into the future and pressing forward into the fields where they know there are wonderful opportunities for new achievement. It is so whether we have have regard to scientific research or to practical application of existing knowledge. But the attitude is perhaps less buoyant in older countries where the legacy of war has included a succession of difficulties involving continuous controversy and struggle. It is in new lands less hampered by such uncertainties that the atmosphere induces a spirit of electrical optimism and unrestrained enthusiasm.

Mr. P. T. Davies, who wrote an article on "The Future of Electricity in Canada" for our Jubilee Issue of November 17th, 1922, recently delivered an address, as the retiring president of the Canadian Electrical Association, in which he placed before his hearers a number of interesting facts regarding electrical progress in Canada. He dwelt with satisfaction upon the very marked expansion occurring both in the number of consumers served and in the horse power installed during the year 1923. The Government records showed that the number of meters in use reached 1,022,522, as compared with 729,880 in 1920. Approximately 50 per cent. of the population live in farming districts where electric service is not available, but the figures for Quebec suggest that where electricity is available at least 80 per cent. of Canadian homes are connected to some source of supply. Canada to-day, it was claimed, headed the world in *per capita* consumption of electrical energy, using 820 kWh per head during 1923.

Looking into the future, Mr. Davies referred to the use of power and its influence as a factor in an ascending civilisation. As man harnesses the resources of nature and makes them his servants, he should be freer to devote his time and energy to "efforts of betterment and progress, which only lead to a happier civilisation." Viewed, then, from the standpoint of power possibilities, Canada should have before her a great future as a leader in civilisation, seeing that only 7½ per cent. of her water power has yet been developed. "We are only at the beginning," said Mr. Davies, "of the development of water powers which are within economic transmission distance of centres requiring electrical energy." Such reflections as these led him to dwell upon the problem of the training and provision of executive officers for the future care of Canadian industry. In his opinion, such officials should be engineers with an all-round knowledge of all branches of the business—engineering, operating, commercial and accounting, and if these were not forthcoming, owing to specialisation and departmentalisation, they would find hydro-electric business being directed more and more by capitalists or the representatives of capital. As one means of taking care of the future in this connection, he advocated the institution of apprenticeship courses by Canadian companies, giving college graduates and other well-educated men an opportunity to obtain complete knowledge of all branches of hydro-electric work.

The World Power Conference at the British Empire Exhibition.

(Continued from page 169.)

Power Transmission and Distribution.

Dr. S. Z. de Ferranti presided in Hall I on Tuesday morning, July 8th, at a crowded session which dealt with power transmission and distribution, four papers being read. The first was on the general subject of high-pressure cables, by Mr. Ll. B. Atkinson, director of the Cable Makers' Association, who showed a sample of the original Deptford cable; reference to this brought forth a strong appreciation of the early work of Dr. Ferranti in this connection, work which will never fail to be talked of whenever high-pressure transmission is discussed. This paper was followed by another on the same subject by Ing. Luigi Emanueli (Italy); this in turn was followed by another on loading limits by Messrs. Fawssett, Melsom, Vernier, and Wedmore—a report prepared on behalf of the British Electrical and Allied Research Association, the subject-matter of which has already been presented to the Institution of Electrical Engineers—and, finally, there was a paper by Messrs. J. S. and W. E. Highfield which, while dealing with the general subject of high-voltage transmission, treated it from the special point of view of direct-current generation and distribution. This was deservedly referred to, by the chairman, as one of paramount importance and dealing with a problem which, he said, would have to be attacked in the future. This paper naturally involved that remarkable piece of apparatus, the transverter, which is to be seen in the Palace of Engineering, and was described in the ELECTRICAL REVIEW for June 27th. Mr. W. E. Highfield, as co-inventor of this machine, took up the task of presenting the part of the paper dealing with it, and told, briefly, the history of its development, adding some interesting information with regard to tests carried out since the paper was written. The series of tests in question had been carried out with nine commutators cut out and only one in circuit. Running at 10,000 volts, which was the designed pressure, currents up to 30 amperes had been carried quite sparklessly. In all cases the limit of load had not been imposed by the machine, but by the supply current or the load tanks. The efficiency curve was flat and high, and Mr. Highfield was convinced that he would obtain eventually an efficiency of over 97 per cent. without difficulty. In these tests he realised what a valuable asset the transverter was likely to be. Thanks to its fixed windings, the exact behaviour of the flux in the magnetic circuit, and of the actions and reactions in the windings, could be gauged. In fact, he went so far as to say that more was known of the flux conditions and the action of the windings than was known of an ordinary d.c. machine or rotary converter. Certainly, without the oscillograph, the transverter could not have been carried to its present state of development. At the moment he was waiting for an increase in the power supply so that the test could be carried out at 100,000 volts, which means that there will be some more interesting experiences with the water resistances. The two machines are then to be placed in service, since no works tests can fully demonstrate the behaviour of the machine. Nevertheless, Mr. Highfield claims to have demonstrated that the machine can be built, that it will run, and that it can be made in sizes large enough for transmission work. The present machines, he is convinced, will develop over 3,000 kW without distress, and a 5,000-kW or 10,000-kW set would be approximately the same size as the present machine.

It may be interesting to add here something of the difficulties which were experienced in the testing of the sister machine to that at Wembley, mentioned above. Designers will, as Mr. Highfield said, view with sympathy the difficulties not only of designing a machine for 100,000 volts, but also of testing it when it is made. It is not easy to make a water resistance for 100,000 volts. Wooden tanks on insulators were first used, connected in series with glass pipes and rubber joints, and with pure water flowing through continuously. The wood caught fire. It was then painted with insulating paint and non-inflammable paint, but it again caught fire. The rubber joints caught fire, and there were times when it was almost thought that the water had caught fire. Jarrah wood was then used, which was better, but now porcelain tanks had been adopted. But there is still the risk of fire through the ionisation of the air. The set had been designed for 1,000 to 2,000 kW, that being chosen as a size which it was thought could be tested and also that could afterwards be used under service conditions. Unfortunately the power supply will not be sufficient for some weeks to give full load. The first trials were run at half speed and frequency and voltage, with dry windings. Under these conditions the machine was loaded to 10 amperes sparklessly. With oil in the tanks and running at 80,000 to 90,000 volts, loads up to 5 amperes have been carried. Then followed the series of tests mentioned earlier, with nine commutators cut out and only one in circuit.

The general discussion was opened by Mr. G. L. Addenbrooke with an interesting résumé of the well-known—and some equally important but less well-known—work which he had carried out in relation to cables and dielectric losses, and he demonstrated how a tiny percentage of moisture was largely responsible for many of our troubles. An explanation of the manner in which this moisture managed to be present was given, on the basis of the electron theory, and whilst it was argued that if we could get rid of this moisture in dielectrics most of our troubles would disappear, it was also admitted that this was no easy matter. The one possible solution suggested was the use of other forms of dielectrics with which it would be more or less simple to get over the moisture difficulty.

Mr. A. M. Taylor followed with a reference to his hexaphase system, described in his Institution paper some time ago. He suggested that, by employing "intersheath" cables, in which the intersheaths were rigidly connected to the tappings of transformers, a considerable advance could be made upon the 132,000 volts which had been suggested by Mr. Atkinson, Mr. Merz, and Mr. Emanueli as the limit of transmission voltage at the present moment. Certain tests had been carried out upon a cable made upon the hexaphase system which, said Mr. Taylor, corresponded to a transmission at 338,000 volts, and it was expected that the cables would not break down until a voltage of nearly 800,000 had been applied.

After a suggestion by Mr. J. W. Lieb (New York) that cable manufacturers were at last waking up to a true appreciation of the problems to be faced with regard to high-pressure transmission, Mr. C. P. Sparks and Mr. Dunsheath contributed remarks on the general question, and they were followed by Mr. Blackburn, who confessed that he experienced considerable difficulty in

visualising how the transverter would operate when under load. Mr. Highfield subsequently did his best to remove these doubts.

In summing up the discussion, Dr. Ferranti, who received repeated ovations during the morning, commenting on the importance of transmission, said the capital invested in that part of the business of electricity supply was rather more than in generation, and he again expressed the view he had so often put forward that the whole business of electricity supply was too complicated at present. In all new processes, of course, the first thing was to get working, so to speak, and to get the commodity to the consumer. Afterwards, attention should be devoted to simplifying and perfecting the process. That was the manner in which the electricity supply problem should be attacked now, so that the whole process could be made more simple, with the result that supply would be cheaper. With cheapness would come universality of use, because they must remember that comparatively few of the people who wanted electricity to-day could get it.

Power in Industry.

The chairman in Hall I in the afternoon of July 8th was Mr. Bellaar Spruijt (Holland), and a series of some 18 papers were read on power in industry. These, for the purpose of discussion, the chairman divided into three groups, *viz.*, power for domestic use; power in industry; and utilisation of power in general. Unfortunately, Sir Alexander Kennedy was unable to be present to give a summary of his paper on "Some Notes on the Future of Electrical Supply and Demand," but the general discussion on the subject of domestic uses of electricity was opened by Dr. Ferranti, who again expressed his well-known views on this subject to an audience who followed him extremely closely, many of them not having had the opportunity of hearing them before. Dr. Ferranti was perfectly frank with regard to certain aspects of the domestic electricity supply problem. He spoke of the inherent conservatism of people who had been used to boiling with a gas ring and who found the electric appliance was slower in operation. That upset things and gave a bad impression, a matter which the designers of apparatus must go into. Then there was the problem of damage to a heating element in a saucepan or kettle through the current being left on with no water in the appliance. As to lighting, the whole standard power should be improved, whilst the greater use of electric power generally would help to improve the atmosphere of our industrial areas and provide more natural sunlight. On the other hand, in artificial illumination we should aim at getting a sunlight effect. Touching upon heating, he emphasised the need for avoiding heating by warm air and for the adoption of radiant heat with plenty of fresh air.

An interesting discussion cropped up during the afternoon as to the desirability of increasing or decreasing the voltages used for lighting and general domestic purposes. There does not seem to be a disposition on the Continent to adopt the general 220 volts of this country, whilst one speaker said that in America there was a tendency to get back to lower voltages. Indeed, the view was expressed that it would be a long time in America before a voltage higher than 120 would be seriously considered on economic grounds. It was suggested that the higher-voltage lamps were not so economical as the lower, and that their higher price was a factor to be considered, whilst greater safety precautions were necessary. On the other hand, a representative from Denmark said supplies were given on the rural networks there at 220 and 380 volts, although he admitted that this was regarded in other countries as dangerous. No objection was seen to using these high voltages, however, in Denmark. In Sweden the voltage varies from 127 to 300 volts, the latter in factories, and although there have been more accidents with the higher than with the lower voltage—which is used for domestic purposes—it is claimed that these accidents are not due to the voltage, *per se*, but to carelessness on the part of workmen.

Incidentally, the chairman told an amusing story with regard to the higher price of lamps for higher voltages. Having found an indisposition on the part of consumers to pay 5s. for the higher-voltage lamp, he decided to sell them, at a loss, for 1s. 3d. each. One of the lamp manufacturing firms, hearing of this, and thinking that the lamps were being obtained at a price to enable this to be done without loss, came to him and offered to supply him with lamps at 10d. each to enable him to sell them at 1s. 3d. each. As a consequence he bought 50,000 lamps and made a profit. Previously he had been paying 4s. each. Another matter of interest in regard to domestic supplies mentioned by the chairman was that M. Luloffs, who read the first paper, had opened a repair shop and carried out any repair to domestic electric apparatus used on the system for 6d. He went so far that if a customer brought in an electric kettle that had burned out, he was given a new kettle or whatever the piece of apparatus might be.

Mr. C. Le Maistre (British Engineering Standards Association) pleaded for greater co-operation between manufacturers and supply authorities in order to get a greater degree of standardisation in the interest of the poor householder. This was one method of increasing the domestic uses of electricity.

One or two interesting points were mentioned by M. Luloffs in the course of his reply to the discussion, such as the provision of a water tank with electric cookers which was always kept at 85 deg. automatically, so that cooking operations were thereby expedited.

Internal-combustion Engine Progress.

Mr. Frederick B. Brown, M.A.I.E.E., of Montreal, presided over the meeting of the Internal Combustion Engine Section held in Hall II, on the morning of Tuesday, July 8th. In opening the session Mr. Brown mentioned that although not used for large electricity generating stations, Diesel engines were useful even in hydro-electric plants for the driving of auxiliary apparatus. They were also proving advantageous during large power plant constructional operations for the provision of power, the more so in that it was possible so to install them as to form ultimately an integral part of the plant. No fewer than nine papers were presented to the section, three being from British experts, two from Germany, two from Italy, and one each from Sweden and the United States.

In his paper Mr. James Richardson, M.Inst.C.E., expressed the view that except in very special cases, the Diesel oil engine as a reciprocating machine could not compete with the steam turbine, while notwithstanding the work which was being done on the Continent in connection with internal combustion turbines, it was in his opinion doubtful whether, without great strides in thermo-dynamics and metallurgy, this type of prime mover could for many years be expected to compete on the score of economy with the reciprocating engine.

Prof. R. V. Wheeler presented a highly technical paper on "Gaseous Explosions within Closed Vessels" which will appeal to designers of flame-proof electrical machinery intended for use in coal-mines.

The paper on "The Gas Engine," by Prof. F. W. Burstall, was noteworthy from the fact that the author held the view that this prime mover must ultimately be the future source of power supply, although he admitted that gas engineers might have to wait until humanity became really anxious on the subject of fuel. Steam turbines were, he considered, probably near the height of efficiency; whereas gas engines were only just commencing.

Signor G. F. Tosi (Italy), dealing with the subject of large internal combustion engines, mentioned that as far back as ten years ago large Diesel oil engines were built for power station purposes and as an example referred to the municipal central station in Rome, which has five such engines of a total power of 8,000 b.h.p. Owing to the high outputs nowadays required steam turbine engines were in more general demand, but in cases where it was desired to put additional units in operation quickly, big Diesel engines offered many advantages. The second Italian paper—that by Signor

Agnelli—dealt with the subject from the point of view of engines for motor transport and aviation purposes.

Dr. Ing. Adolph Nagel exhaustively described the latest developments in connection with Diesel engines in Germany, drawing special attention to four points, *viz.* (i) that the main type of engine has now been freed from certain handicaps caused by a too close adherence to the original design; (ii) that the two-stroke cycle is now being successfully used for large engines; (iii) that there is an increasing tendency to inject air and atomise the fuel without the aid of compressed air; and (iv) that much progress has been made in the use of fuel of low ignitability. He mentioned that as recently as December last, trials had been commenced of a new double-acting two-stroke Diesel engine having a bore of 800 mm. by 1,050 mm. stroke, the results of which had been so encouraging that the construction of a six-cylinder engine on similar lines but capable of developing 10,000 effective h.p. at 94 r.p.m. was now being planned.

Prof. E. Hubendick, of the Royal Institute of Technology of Stockholm, in a paper on "Internal Combustion Engine Development in Sweden," mentioned that in view of the important progress of hydro-electric plants in recent years, internal combustion engines were now, from an electricity generation point of view, of relatively small importance. He estimated that the developed water power in Sweden now amounted to more than 1,000,000 h.p., as a consequence of which many of the old internal combustion engine central stations, although retained, were only now used for supplying peak loads and as reserves in case of power interruption and water shortage. Even in new hydro-electric supplied districts, reserve Diesel engine plants were still being installed, a special quick-starting or so-called "reserve type" of engine having been developed for this purpose. Notwithstanding the hydro-electric developments, good work was still being done in Sweden in the production of gas suitable for gas engines from such indigenous fuels as bituminous shale, wood, wood refuse, and peat. In connection with the latter Prof. Hubendick mentioned that several peat gas central stations had been built, the largest one—of 1,500 h.p.—being on the Island of Gottland. There were also several stations using wood gas, one of 1,100 h.p. being in operation at Ljusne-Voxna.

Large Gas Engines in Germany.

Herr Paul R. Meyer (Nuremberg), in a paper on "Large Gas Engines in German Power Economy," drew attention to the progress in the construction of high power gas engine units and the improvement of the output of such prime movers by scavenging and supercharging. He demonstrated by means of actual figures that a modern gas engine plant working on a 70 per cent. load-factor, could produce from the same quantity of fuel, a continuous output of 75,000 b.h.p.-hours, as against only 51,700 b.h.p.-hours from a steam turbine plant and at a lower cost per b.h.p.-hour. Thus Herr Meyer held that compared with the steam turbine the large gas engine remained even at present, having regard to the utilisation of the waste heat of the exhaust gases and the cooling water, the most economical and most reliable prime mover for new plants, particularly in iron and steel works, at collieries, paper mills and chemical works, or for the extension of such power generation plants which relied on a high load factor.

Prof. Chas. E. Lucke, of Columbia University, New York, presented an exhaustive review of internal-combustion engine adaptations. While this dealt largely with the subject from the automobile and transport aspect, he mentioned that, notwithstanding the increasing range of electricity supply in America, small internal-combustion engine dynamo units had been adopted in great numbers, and that even near electric transmission lines they did not appear to feel the competition of the electric motor. Large gas engines of several thousand h.p. were, however, not increasing in use, as steam and hydro-electric plants of large capacity were able to show better power costs, particularly having regard to the prevailing low fuel prices.

(*To be continued.*)

List of Papers.

(*Concluded from page* 169.)

SECTION M

ECONOMICAL, FINANCIAL, AND LEGAL.

355. The International Joint Commission and the International Water Powers of Canada: Lawrence J. Burpee (U.S.A.).
361. Legislation for Electricity Supply in New Countries: Prof. J. N. Van Der Ley (Dutch East Indies).
362. Législation française en matière de chûtes d'eau et de distribution d'énergie électrique: MM. Domergue et Lecat (France).
363. The Financial Aspect of Hydro-Electric Development: George Balfour, M.P. (Great Britain).
364. Effect of Depreciated Currencies and International Financial Conditions on Power Development within the British Empire: Sir Ernest Harvey (Great Britain).
365. Government Co-operation in Power Development within the British Empire: The Rt. Hon. Sir Philip Lloyd-Greame, M.P. (Great Britain).
366. The Economics of World Power: Major-General Sir Philip A. M. Nash, K.C.M.G., C.B., M.Inst.C.E., M.I.Mech.E., Associate I.E.E., M.Inst.T. (Great Britain).
367. Executive and Administrative Interest by Public Authorities in the Supply of Electricity in the Netherlands: J. G. Bellaar Spruyt and Dr. E. A. Schoon (Holland).
369. Review of the Legislation on Water Power and Electricity in Norway: Henry Larssen (Norway).
370. The Financing of Loans for Power Development: B. Stuevold-Hansen (Norway).
371. Power Policy: C. Kleman, C.E. (Sweden).
372. Government Policies best adapted to promote Power Development: Hon. Herbert Hoover (U.S.A.).
373. Private *v.* Public Ownership and Operation: Arthur T. Hadley (U.S.A.).
374. Financing of Power Development in the United States, S. Z. Mitchell (U.S.A.).
375. The Relation of Power Development to Industrial and Economic Progress: General Guy E. Tripp (U.S.A.).
376. Power Development from the International Standpoint: Owen D. Young (U.S.A.).
377. Public Utility Regulation in the United States: Carl D. Jackson (U.S.A.).
378. New Fields for Power Application: E. W. Rice, Jr. (U.S.A.).
379. Power Development in Relation to Human Progress: Julius H. Barnes (U.S.A.).
380. The Social Aspect of Power Development: F. R. Low (U.S.A.).

SECTIONS N 2, 3, 4 AND 5

GENERAL.

N2

391. Austrian Laboratories for Technical Research and the Testing of Materials: Technisches Versuchsamt im Bundesministerium fur Handel und Verkehr (Austria).
392. Electro-Aeronautic Research Work: Engineer O. Taussig (Austria).
393. Divining Measurements by Means of the Torsion Balance in Austria: Hofrat Prof. Dr. Richard Schümann (Austria).
394. Organisation of Research Work in Sweden: Dr. A. F. Enstrom (Sweden).
395. Standardisation in Austria: Ing. Dr. J. Tomaides (Austria).
396. Electrical Standardisation in the Dutch East Indies: C. D. Volker, M.N.R.I.E. Dutch East (Indies).
397. Standardisation—National and International: C. Le Maistre (Great Britain).
398. Considerations as to the most Economical Ratio of Increase in a Series of Standardised Main Dimensions: Prof. Ir. J. Goudriaan (Holland).
399. Proposal for Uniform Rules for Testing Water Power Plants: Prof. G. Sundby (Norway).
400. Standardisation and Control of Electrical Accessories and Household Appliances: H. Grosch (Norway).
401. Industrial Standardisation in Sweden: A. Kruse (Sweden).
402. International Standardisation in the Field of Power: A. E. Kennelly (U.S.A.).
403. Etat actuel des co-operations techniques internationales: Dr. Guillaume Exner (Austria).
418. Standardisation in Germany: Baurat Dr. Ing. F. Neuhaus (Germany).

N3

404. The Training of the Apprentice: Prof. A. P. Laurie and Prof. F. G. Baily (Great Britain).
405. The Training of the Engineer of the Future: A. P. M. Fleming, C.B.E., M.Sc. (Great Britain).
406. The Influence of Broadcasting: J. C. W. Reith (Great Britain).
407. Education of the Engineer in the Netherlands and their Colonies: Prof. A. Van Royen (Holland).
408. Elementary Engineering Education: N. Fredriksson (Sweden).
409. Advanced Engineering Education in Sweden: H. M. Pleijel (Sweden).
410. Education for Commerce: Prof. C. Hallendorff (Sweden).
419. Co-operation of Industry with Technical Schools: Prof. Dr. Conrad Matschoss (Germany).
420. Technical and Commercial Education in Esthonia: Esthonian Ministry of Trade and Industry (Esthonia).

N4

411. Health Conditions and Welfare Work in Austria: Sektionsrat Prof. Dr. Ernst Brezina and Ministerialrat Dr. Mumelter (Austria).
412. Man in Relation to Production: D. R. Wilson, M.A. (Great Britain).
413. Psychotechnics in Holland: J. L. Prak (Holland).

N5

414. Public Interest in Mechanical Progress: T. C. Elder (Great Britain).
415. The Place of Publicity in the Public Service of Electricity Supply: J. W. Beauchamp, M.I.E.E. (Great Britain).

A New Single-phase Motor.—Mr. S. R. Bergman describes in the July issue of the A.I.E.E. *Journal* a new type of constant-speed a.c. single-phase motor, the novel feature of which is the armature, which consists of a combination of three elements, namely: a commutated winding, a squirrel-cage of high reactance, and a commutating device consisting of shielding metal strips. The machine when starting and accelerating has the characteristics of a series motor and when up to speed those of a shunt motor. The change over is accomplished without any automatic device, it taking place due to the inherent qualities of the machine. The new motor has a high power factor and its commutation is as good as that of a d.c. commutating-pole machine.

Notes on Electric Lifts.

By S. L.

(*Concluded from page* 173.)

Efficient brake-gear is absolutely indispensable. The electro-mechanical brake of to-day is a dependable and satisfactory piece of mechanism if maintained in proper order. Such brakes require periodical overhauling and adjusting, and care must be taken that the friction members are renewed before allowing the blocks, bands, or shoes to rub on the metal drum or coupling. Neglect in this connection may easily result in serious damage to both the brake blocks and coupling. Wood brake blocks should be discarded if surfaces show signs of charring. Fabric (textile) linings sometimes wear out unduly quickly; this may occur from various causes, and new bands or strips should be fitted in good time before the rivets get damaged. Friction linings require to be fitted properly if the best possible service is to be expected. Regarding brake-coils and their electrical connections, these should be closely examined from time to time, and if any signs of serious deterioration are present the defective details should be renewed. Generally speaking, patch-work repairs are not very satisfactory or of a lasting character. Brake-coils especially are apt to give trouble after long service from the effects of continual overheating, vibration, and "ageing" of the insulation. The effect of vibration is particularly pronounced on alternating current brake-gear, hence all points of connection—both mechanical and electrical—require maintaining tight and sound, and such details should be rigidly inspected for faults; it is not a little surprising how rapidly massive metal will fail on a.c. brake-gear. A properly-adjusted and timed brake means—everything else being equal—a smooth working lift with an absence of vibration and jarring, especially when starting and stopping.

The manufacture of stranded steel wire ropes has been brought to a high standard, and with a high-class rope of a suitable type and quality, properly fitted for its particular duty, a straight failure from breakage of the rope is an extremely rare occurrence. Steel lifting ropes should be of correct dimensions in relation to the grooves in the driving drum or sheave and diverter or guide pulleys; perfect alignment, particularly between the rope and driving sheave, is essential for satisfactory running. The grooves in the sheaves require watching for undue wear, causing "slip," which may arise from the ropes "bottoming" on the grooves. Guide sheaves should be kept free and well lubricated—such pulleys seem to have a propensity for "seizing" on their spindles. It is obvious that when being fitted, and especially at a renewal, lifting ropes require reeving very carefully and uniformly adjusting for tension, otherwise trouble may subsequently develop through overlapping and slack ropes. Steel stranded lifting ropes should be kept properly lubricated; it pays to use an efficient lubricant; any sort of greasy refuse will almost certainly cause mischief sooner or later. Practically as important as the rope itself, such details as anchorages on driving-drums, sheaves, balance-weights, shackles, cable-eyes, clamps, clips, even down to common bolts, nuts, and screws (of the last-named too much is far too often taken for granted) should be periodically "gone over," and terminal ends of ropes are much better neatly "whipped" and tucked safely out of harm's way. It might almost seem superfluous to stress the importance of cleanliness in these mostly unseen details, but it is worth while on the score of safety, and inspection is also considerably facilitated.

Considering their important—almost vital—function, lifting ropes require to be thoroughly examined throughout their *entire* length, especially the normally unused portion, by a competent engineer frequently; the amount of wear should be checked and broken wires closely watched for extension. All defects, however seemingly slight or small, should be noted and investigated. It is a good plan to keep an accurate record of all ropes. No hard and fast rules can be stated for renewal of steel wire ropes; local circumstances, nature of drive, &c., will all require to be taken into consideration, and each individual case treated, so to speak, on its merits. For instance, the writer has in mind the case of an electrically-driven lift where a new complete set of lifting ropes is required on the average every 18 months. In another case the original ropes are still doing daily duty after well over 20 years' continuous service. Often exigencies of space will preclude the best possible arrangement of drive, and the resultant form of layout of closely-pitched driving and guide sheaves involves the bending backward and forward of the suspension ropes, the effect of which is to set up alternating stresses which obviously tend to materially shorten the useful working life of the ropes. Over-running at the floor landings or other entrances necessitating "inching" of the car or cage to bring it to its proper level imposes abnormal strains on the whole lift structure, and especially the suspension ropes and brake-gear. A sudden jerk on a heavy load is extremely liable to injure a sound rope, and under certain conditions may even cause a perfectly good rope to break.

The term "safety gear" is usually taken to imply the means provided for preventing or arresting the car or cage from falling down the lift shaft in the event of the suspension ropes breaking, or due to excessive overloading. The safety gear of to-day is practically the same—at least in principle—as that of 20 years ago. Many improvements and modifications have, of course, been effected, but, as generally made, it is of a conventional form having grips or cams operating on the car guides. There are various makes or types differing only in their mode of operating, mostly by rope release, some by governor-tripped rope, centrifugal and gravity, or spring pressure. In all types, however, the car depends on being arrested in its descent by being wedged in the guides by the action of the grips or cams. If from any cause these grips (the lift fraternity refer to them as "dogs," their surfaces being serrated or of tooth formation) are prevented from coming into action, anything might conceivably happen, as the car would be free to fall down the shaft. It is very important, therefore, that safety gear be maintained in thoroughly sound working order, and such gear should be tested periodically to ascertain that it will act promptly and securely hold up the car. Prompt action is essential, as a falling car well under way would probably over-run the safety gear; in any case, where the grips lag badly or slip, the car and guides usually get damaged extensively. Inspection of the gear should be thorough and searching, as it abounds in small and auxiliary details, the failure of any one of which would seriously affect the satisfactory working of the whole. Such details as the grips or cams have a tendency to work loose on their spindles, due to keys, pins, or set screws coming unfastened. Springs rust and eventually break, usually unnoticed at the time. Small diameter wire cables, normally stationary, develop a permanent "set," and resist movement at a critical moment or rust and snap. Turnbuckles and similar adjusters get out of their original setting sometimes, due to spinning of the rope. Bearings (almost invariably iron to iron) dry up and stick and rust, oiling-holes get choked, and so on.

Wood guides or posts require examining for wear and lack of alignment; these are liable to warp and twist under adverse atmospheric conditions, and mysterious "troubles" have occurred in this connection. When safety gear has been in operation, the surfaces of wood

guides, if much damaged, should be trimmed and levelled, and, if necessary, the defective sections renewed entirely. Usually, metal slips and guide rods do not sustain much more than superficial surface damage. Metal guides should be inspected throughout their entire length, and points of attachment to brackets, walls, &c., watched for projecting screw-heads which not infrequently work loose and foul the car guide slippers, with consequent injury to the latter. The guides for the balance-weight should be watched for movement, due usually to lateral swinging of the weight, especially when of the solid cast frame compound type fitted with loose tongues. Detachable weights should be securely anchored, and it is preferable *not* to mix lead with cast-iron weights. It is a good plan to keep a record of the history of each balance-weight, and any alterations or additions clearly stamped or painted on its frame. Dry lubrication is recommended by most makers for wood guides, and oil or grease for metal guides.

The car itself should be inspected regularly at its frame joints, tie rods, or bars and stays; bolts and nuts have a knack of working loose, rivets may shear off, and welded joints sometimes fail. The top of the car should be efficiently protected, and where guard netting is fitted the fastenings require overhauling from time to time. Ornamental glazed canopy tops should be kept tight and secure; an accident from broken glass may mean a heavy third-party claim. Any alterations or additions to the car, especially openings not provided originally, should be particularly noted as affecting the safety of the lift. The guide-slippers or runners should be watched for wear, and excessive "side play" in the car prevented by timely adjustment. It is a practice of some firms to keep a record in the car of rope renewals, repairs, &c. This is a good plan, as such information obviously is instantly available for reference and need not necessarily be posted up to public gaze.

A modern lift controller is a dependable piece of apparatus, and if kept clean and its mechanism properly adjusted, requires little beyond ordinary attention. Renewable contacts of sliding members, "make and break" switches, blow-out tips of clapper switches, and the like, require trimming and replacing periodically; oil and air dash-pots should be inspected for possible evaporation, "seizing," &c. Regarding these details, erratic operation of a controller may often be traced to a maladjusted dash-pot, and a single turn of its relief screw will make all the difference between good and bad working of a lift. Rubber or spring buffers on rheostat plungers quickly deteriorate, and should be renewed in time, otherwise the switch mountings and slate panel may get seriously damaged from the effects of the heavy resultant pounding. Gear-wheels and sprocket-chains require occasional adjustment, and should be preferably dry lubricated, if at all necessary. The "back" of the controller should not be allowed to accumulate dust, and all insulation surfaces watched closely for "creepage," and slate panels for cracks. Practically no lubrication is necessary in a well-designed controller, and oil is as much out of place here as in the winding of the motor.

Lift and hoist shafts or wells should be completely enclosed on all sides throughout their entire length, and especially on the side where the balance-weight is suspended. No unguarded openings where it is possible to insert a hand—one might wish not even a finger—should be permitted. Sometimes the balance-weight is suspended in a separate shaft or recess apart from the lift shaft proper. In such cases it is imperative on the score of safety that all inspection and other openings, which usually are fitted with plain hinged doors, should be kept under lock and key, and not merely held closed by some form or other of hand-catch. The writer considers, in the case of premises where such door openings are accessible to the general public, that these should be effectively sealed up and rendered proof against interference by unauthorised persons. One hardly cares to dwell on the possible consequences following an over-inquisitive individual poking his head through an inspection opening and meeting with a descending balance-weight! Ample head room at the top and adequate space at the bottom of the lift shaft should always be provided. Stops or buffers fixed at the bottom of the well are, if at all possible, better arranged in a vertical position, so as to leave the centre portion clear and unobstructed; cross-beams or girders are a source of danger, especially when used as a permanent stop for the car in a shallow well bottom.

There are numerous lifts in use, mostly of the passenger-goods type, which have been converted from hydraulic or belt to electric drive. Often these structures will be quite ancient, and although probably more or less suitable under the old conditions for which they were originally designed, do not readily lend themselves to being altered comprehensively and equipped with electric control and automatic interlocking appliances. Due probably to long-standing general wear and tear, deterioration, &c., the rejuvenated lift will often fail to function properly, at first sight seemingly from no well-defined cause, and so prejudicing its owner against the new-fangled hoist gear. Usually it will be the promise held out of higher travelling speeds than hitherto, lower initial first cost, &c., than a new hoist proposition, which has been the determining factor in persuading the owner to convert his old hoist, only to find that the results are disappointing and probably regretting his decision subsequently. The question of a proposed conversion of any hydraulic or belt-driven hoist of over 20 years' standing requires most careful consideration, and higher travelling speeds should never be attempted unless it be conclusively proved that the existing structure will not only efficiently, but with an ample margin of safety, permit of higher duty in this direction.

A type of goods lift commonly used in textile mills is of the belt-cum-worm pattern, driven usually from the mill shafting and sometimes through counter-shafting by an electric motor, generally self-sustaining and fitted with an integral brake of the band-type, actuated by the belt-striking gear. This class of lift has been responsible for a large number of accidents, probably more than any other. Rarely is the cage provided with safety gear, and up to comparatively recent times few of such hoists were fitted with automatic interlocking doors. Extremely primitive in design and construction, many of these lifts have been going for upwards of 40 years, and the origin of some of them, on inquiry, would seem to be lost in antiquity. Considering the lack of adequate safety appliances in many cases it is, to say the least, somewhat surprising that more accidents do not occur.

Further, the cage, to facilitate the handling of goods, is usually completely open on two of its sides, and often three openings will be provided; in addition, the top is more often than not entirely unprotected, fencing or guard netting being rarely used. An accident involving the parting of the suspension ropes, say, would in the majority of cases, free both the cage and the balance-weight precipitately to the bottom of the lift shaft, probably with very disastrous results. If, as sometimes occurs, there be another room below the shaft bottom, the consequences would be more serious still. Landing doors fitted with automatic (mechanical) interlocking gear should be closely examined, particularly where the bolt or other device engages with the door and the interlocking member. The control chains and ropes are invariably of considerable weight, and a disengaged chain or its fittings falling on a person in the cage might cause a serious accident, hence the importance of close periodical inspection of this gear. It is a well-known fact that this type of hoist has a tendency to start working involuntarily, due to "creeping" of the driving belt from the loose or "idler" pulley to the driving pulleys; this may occur through various causes. Although in the majority of textile mill hoists an attendant will usually be provided, the work is almost always looked upon as a sort of a "soft job," and so it is common to find such work relegated to an individual who is considered physically unfitted for any other task; hence, one-armed and one-legged men are often engaged in this capacity, and occasionally more badly incapacitated men still are seen working as hoist attendants.

The undoubted value of efficient inspection cannot be

over-estimated, and it is pleasing to note that owners and users generally are coming to realise its worth more and more. Unquestionably, the excellent service rendered by insurance combined with inspection has been mainly instrumental in achieving such good results, and the benefits of insurance with inspection on broad comprehensive lines, as obtainable to-day, make it such a sound business proposition that it cannot be ignored by the lift owner alive to his best interests.

It may perhaps not be so well-known that for many years past Continental countries have had in force statutory rules and regulations for the safeguarding and working of lifts, hoists, &c. In Germany the regulations are very comprehensive and stringent, and provide, amongst other requirements, that all lifts and hoists shall be labelled with particulars of the load or number of passengers. In Belgium and France also, similar regulations are in force, and it is significant to note the importance which is placed on the proper display of notices regarding the safe carrying capacity of all lifts, hoists, &c., in these countries.

In the foregoing notes the writer has refrained from giving a stereotyped description of the modern electric lift, as its inclusion is hardly necessary for the purpose of the present article. Further, beyond brief reference, matters affecting driving gear, motors, and controllers have not been discussed, as these important details, although admittedly coming strictly within the purview of the subject, would, to do them ample justice, require a goodly printer's column each. The writer, in conclusion, trusts that the matter may prove interesting and possibly of some service to the class of reader for whom it is primarily intended.

The I.E.E. Regulations for the Electrical Equipment of Buildings.

A Review.

By DONALD SMEATON MUNRO, M.I.E.E.

THE new Wiring Rules have now been issued by the I.E.E. under the title of "Regulations for the Electrical Equipment of Buildings."* The publication has been long looked forward to and by none more eagerly than by the members of the Wiring Rules Committee. This Committee is composed of some three dozen gentlemen representing the Institution, contractors, manufacturers, cable makers, suppliers, fire offices and supervisors. Large committees do not always make for speedy business because conflicting interests take time to discuss and reconcile. It is possible, indeed, that the final result is not in accordance with the idea of any particular section or individual, but is the best practicable compromise.

The Committee has been fortunate in having as its Chairman and Vice-Chairman respectively, Mr. C. H. Wordingham, C.B.E., and Mr. Ll. B. Atkinson, who by their gifts of patience and skill in reconciling diverse opinions have brought what at one time looked like a hopeless task to successful fruition.

The scope of the Rules has been extended and the reviewer feels as he goes over what is now a considerable book (of more than 124 pages) that a sincere effort has been made and much achieved for the welfare of the consumer and of the electrical industry generally.

The format of the book is uniform with the "Electrical Equipment of Ships," issued in 1919, and the general scheme has a strong family resemblance. The Regulations are intended to apply to every type of dwelling house, business premises, public building and factory. Where applicable they must be supplemented by "The Regulations prescribed by the Electricity Commissioners," the Home Office "Regulations for the Generation, Transformation, Distribution and Use of Electrical Energy in Premises under the Factory and Workshops Act," the Home Office "Regulations as to the Installation and Use of Electricity under the Coal Mines Act, 1911," and the regulations issued by the licensing authorities for theatres and other places of public resort.

It is unfortunate that a set of rules so comprehensive as those now issued should still involve reference to others, but apparently this is inevitable in special cases.

The regulations provide for wiring for pressures ranging from 650 volts down to the very lowest voltages used for lighting distribution in buildings.

The section devoted to Definitions is similar to the corresponding portion in the Ships' Regulations and somewhat longer than has been customary in former issues. Among these, for the most part, clear definitions, that of "Point" remains as in the issue of 1916 and this has always appeared unsatisfactory. The definition runs:—"A *point* is the termination of the wiring for attachment to a fitting for one or more lamps or other consuming devices." Now this may mean a socket termination for a 5-watt "Osglim" lamp or for a 500 h.p. motor. It may mean the ceiling terminal of a small light in a cellar controlled by a single switch or a 50-light electrolier fed by seven circuits and controlled by 14 branch switches. There are many members of the public and not a few in the electrical industry who are sure of one thing—which is, that electrical work costs "a pound a point." Perhaps the point as re-defined in the Rules may help to burst this tough bubble.

Several pages are devoted to systems of wiring, such as d.c. 2-wire and 3-wire and alternating 2-phase and 3-phase. Directions as to the minimum requirements for switchboards and fuseboards are included; pilot lamps and voltmeters must have fuses in circuit.

The sections dealing with flexibles must be read carefully as there are several important changes. It is interesting to note that the Committee recommends the use of flexible cords of circular or oval section. Apparently we are to follow the American practice and it is questionable if many fitters will like this. Circular flexible has by no means proved perfect and is awkward to treat at socket ends. It is to be noted that no joints in which flexibles are involved are to be soldered, but must be made by means of shrouded connectors. A novelty is the introduction of a scale of maximum weights which may be carried by flexible cords.

In all installations where a circuit carries more than 100 amperes, an automatic device to disconnect that circuit must be provided to act in the event of leakage to earth. This is additional to the overload fuse or circuit breaker.

When we come to deal with final sub-circuits they must be as follows:—

* "I.E.E. Regulations for the Electrical Equipment of Buildings." (Eighth Edition.) Printed by Messrs. E. & F. N. Spon, Ltd., 57, Haymarket, London, S.W.1. Bound in paper covers, 1s. net (1s. 2d. post free). Bound in cloth cover, 1s. 6d. net (1s. 8d. post free). Obtainable at the offices of the Institution at Victoria Embankment or from Messrs. E. & F. N. Spon, Ltd.

Where the total rating of the points supplied from the sub-circuit does not exceed

6	amperes	...	10	points	are allowed.
8	,,	...	6	,, ,,	,,
10	,,	...	4	,, ,,	,,
20	,,	..	2	,, ,,	,,

Final sub-circuits supplying one lamp or appliance are not limited as to current-carrying capacity. A note is added to this paragraph to the effect that when the fusing current of the fuse controlling a final sub-circuit exceeds 8 amperes, then no flexible cord on the circuit shall be too small to carry safely one half of the fusing current referred to. This is a much needed regulation in those districts where, encouraged by a combined rate or otherwise, there has been a tendency to add heaters indiscriminately to existing lighting sub-circuits. Manufacturers should be prepared to meet an increased demand for lampholders and keyswitch holders protected with insulating material, as this class of holder is specified for bathrooms and portable devices.

Quite a fair measure of freedom is allowed in the use of taped and braided cables on cleats, and also as regards hard metal sheathed cables and tough rubber compound cables. Only the first of these varieties of wiring need be protected by conduit when passing under floors or buried in plaster. A qualifying clause with reference to these methods reads "if liable to mechanical damage they are to be adequately protected having regard to the nature of their sheathing or casing." The efficiency of metal sheathed cable bonds is so far safeguarded by the necessity of limiting the electrical resistance to 2 ohms between the metal covering near the main switch and the metal covering of any other part of the cable throughout the installation.

Wood casing is still permitted in dry situations, and circuit wiring, on low-pressure sub-circuits only, may be run with flexible cords on china cleats. Anyone contemplating the use of an earthed concentric system should read carefully the limiting conditions as to the application of this method.

It seems odd to find in wiring rules (considering the important part metal conduits rightly play in wiring distribution) that less than two pages are devoted to this method of protection.

It is to be observed that all conduits complying with the regulations are to be made in accordance with the British Standard Specification, No. 31. This precludes the employment of gas size conduits, the use of which is still fairly common, especially with the plumber-electrician whose tools it suits.

A ventilating outlet is to be provided at the highest and lowest points on each circuit in a conduit installation. Will that rule be kept? Is it desirable? Normal circulation of air in a metal conduit does not mean a drying current, but a condensation of replenished moisture. Proper provision is to be made at all conduit ends to prevent abrasion.

Plain slip sockets are naturally not looked on with favour, some form of screwed or grip joint which will give ample and permanent electrical conductivity and mechanical rigidity being necessary.

Non-metallic conduits, provided they are non-ignitable, non-absorbent, damp-proof, mechanically continuous and strong, are permitted under certain conditions.

It is evident that the Committee has found the question of earthing a difficult matter and it is proposed to issue a further specification on this subject at a later date. The general rule meanwhile stands—that an earthing cable shall be not less than one-half the sectional area of the largest conductor to be protected and no earth lead is to be less than .0045 square inch sectional area. Great care is to be taken to secure as far as possible that the earthing systems shall be such that the combined resistance of the earthing lead and of the earthing system itself is low enough to permit the passage of the current necessary to operate the fuse on the earth leakage trip of the circuit-breaker protecting the circuit.

The increasingly important subject of lifts and hoists is disposed of in three short paragraphs. The last of these is of most general interest as it may affect all the sub-mains and some of the circuit wiring of buildings. The paragraph states that all cables in the shaft, except trailing cables, shall be enclosed in metal conduits. This precludes what is the very common practice of utilising the vertical shaft as a path for lead-covered cables, wires in casing, or whatever system happens to be in use for general lighting.

The rules wisely specify that all heating and cooking appliances shall be provided with a terminal to which an earthing lead may be connected. It is not quite clear whether it is intended that all radiators and portable cookers should be earthed to agree with regulations. It should be noted that each heating appliance is to be controlled "as a whole" by a switch. At present there are many cookers controlled by two or three rotary wall switches without a main master switch. Numerous heaters, cookers, &c., are divided into two or more distinct sub-circuits. This has proved a convenience in practice, as it worked well with the distribution from, say, an ordinary 15-ampere sub-fuse board, and tended to reduce the risk and damage if short circuit occurred. The compulsion to use a master switch will be awkward also in the case of some well-known makes of decorative heaters where it has been the custom to have separate fuses and controls for the elements and for the glow lamps. Such electric fires are usually fitted in finely-finished apartments where, say, a 50-ampere d.p. switch is out of place to all but an electrical inspector.

Some useful observations are made in the regulations as to positions of heaters and the temperature limits of the frames, switches, and terminals. Hand shield plug tops are required for all appliances taking more than one amp.

Under the heading of "testing," consumers are reminded of the importance of keeping all appliances clean and dry and of the value of systematic inspection. The general insulation test remains as in the former rules, *i.e.*, not less in megohms than 25 divided by the number of points in the circuit. On a final sub-circuit the insulation resistance need not exceed 1 megohm.

Further latitude has been allowed in the case of motors and apparatus other than incandescent lamp circuits, and an insulation test of half a megohm is all that is now demanded between the frame and live parts.

For ordinary circuits it is advised that tests should be taken between all the conductors connected to one pole or phase and all the conductors connected to the other pole or phase, except in the case of concentric systems with earthed outers. Many engineers will set more store by this recommended test than by the test with all lamps, &c., in circuit, and it would have been useful to have some guidance as to official requirements under these conditions.

An advantageous addition has been made by including a continuity test of metal sheathing. It is stated that there must not be a greater resistance than 2 ohms between a point near the main switch and any other point on the conduits or metallic envelopes of the cables.

The final regulation (No. 128) has reference to additions, and refers to the necessity of ascertaining the capacity of the existing system before the current is augmented. Particular attention shall be paid to the case of heating sockets and to the possibilities of these being in simultaneous use.

No less than 15 sets of tables are included at the end of the rules. These, to some extent, overlap information which can be obtained in the British Standard Specifications, but they are all relevant to wiring and are conveniently inserted here.

The tables most often consulted will be those dealing with current-carrying capacity and fall of pressure in cables.

Table IV treats of v.i.r. cables, and Table V deals with paper- and lead-covered cables, and it makes a good change in having these separate instead of retaining the somewhat unweildy combined table issued with the former rules.

The maximum current limits for given sizes of conductors remain as before, but the lengths, given in feet, for the total lengths of circuits have been revised. Columns have been added to both tables dealing with concentric, twin, and three-core cables. Full notes are attached to the tables explaining the conditions to which the stated figures are applicable. Table XIII gives the fusing currents of copper wires, and No. XIV those of lead-tin alloy, and valuable notes regarding fusing are added to these tables.

Some three dozen British Standard Specifications are referred to in the text, and a list of the official numbers of these is given in the appendix.

The final eleven pages contain a very complete index.

A detailed examination of every question raised or settled by the regulations would far outrun the space reasonably available for an ordinary review.

The regulations do not terminate all uncertainties nor reconcile all differences of opinion upon policy, but the Committee has achieved agreement on many matters which should enable us all to pull together until the time is ripe for a further issue.

The London and Home Counties Electricity District Order.

THE London District Order, as made by the Electricity Commissioners and presented to the Minister of Transport for confirmation, shows very considerable alterations from the Draft Order, which was the subject of an inquiry held during last May. Some of these alterations are concessions to objections made by various municipal undertakers, generally on the technical ground that the provisions objected to were *ultra vires*, backed by intimations that unless the provisions were deleted or modified, legal proceedings would be taken to restrain the Commissioners from including them in the Order.

These alterations are generally as follows:—

Technical Scheme.—The technical scheme set out in the second annex to the Order is to be considered by the Joint Authority, which is to report to the Commissioners within twelve months. Consequently, the second annex is now put into the form of suggestions, instead of a programme for the Joint Authority to carry into effect. What will be done, therefore, depends upon the deliberations and report of the Joint Authority and the consequent directions of the Commissioners. The clause of the second annex providing for the exercise by the Joint Authority of control of the working of the local authority stations and transmission lines, and the third annex to the Draft Order, which gave a list of local authority generating stations, &c., which were within twelve months to be transferred to the Joint Authority, are both deleted. The Joint Authority will therefore have no power of control over the working of local authority stations, and has no right to acquire any of them, excepting a general power to do so by agreement with the owners. The London companies, the North Metropolitan, and the Metropolitan companies, however, remain under the obligation to carry out their parts of the technical scheme as set out in the Second Schedule, or as these may be modified or varied with the approval of the Commissioners, presumably after the Joint Authority has reported upon the whole scheme.

Technical Advisory Board or Committee.—The Joint Authority *may* appoint a technical advisory board or committee, consisting of duly qualified persons, to advise the Authority upon any technical matters referred to it. This is instead of the Joint Authority being required to appoint such a board consisting of representatives of the municipal and company undertakers (with a small company majority) with a defined range of advisory duties. The difference is not only the substitution of "may" for "shall," but the composition of the body and the subjects to be referred to it are left entirely to the discretion of the Joint Authority, which need not set up the body at all.

Supply Outside the Areas of Authorised Distributors.—The Joint Authority remains under the obligation to submit, within two years, proposals to supply in areas which have none, but these proposals may include extensions of the areas of authorised distributors, instead of being limited to direct supply by the Joint Authority.

Borrowing Powers.—The Joint Authority is empowered to borrow £7,000,000 as a maximum, instead of the £10,000,000 tentatively inserted in the Draft Order. Under the 1922 Act further borrowing powers can be given by a Commissioners' Order, confirmed by Parliament.

Constitution of Authority.—The body is to consist of 31 elected members, against 27 proposed in the Draft Order. Two of these four additional members are to represent "workers in the industry"; the other two additions are one each to local authority undertakers within and without the County of London respectively. There are some alterations in the distribution of these local authority representatives; West Ham is the only undertaker with direct representation. The metropolitan borough undertakers have eight members elected jointly, instead of Hackney, Marylebone, Stepney, and Poplar having one each, and the other boroughs three jointly. The London companies are to elect one each for the "ten-company" and "four-company" groups, instead of two jointly. Reckoning the county councils as "municipal," there will be 23 municipal to four company representatives, with the two for the workers and two for the Railway Companies' Association, who may be neutrals. This compares with 21 municipal, four company, and two neutrals in the Draft Order.

The elected members are to elect a chairman, who "need not be" one of themselves, instead of "shall not be," in the Draft Order. If an outside chairman is appointed, he becomes a member, and the number will then be 32, against the 28 of the Draft Order. The chairman may be paid.

Companies' Tenure.—Other alterations are in respect of the terms upon which the companies may be granted extensions of the tenure of their undertakings within the County of London. In place of the Second Schedule of the Draft Order, which set out a general statement of principles upon which the extension would be granted, subject to the consent of the London County Council, the Order, as made, includes in its Second Schedule copies of the agreements made between the London County Council and the "ten-company" and "four-company" groups, and the sliding scale between prices and dividends scheduled to those agreements. The London County Council having assented to the extension of tenure, and the transfer of its purchasing powers to the Joint Authority, by sealing the agreements, the Second Schedule definitely validates the transfer and extensions, subject to the Bills of the two groups now before Parliament being passed into law in the session of this year or next.

This condition is necessary because some terms of the agreements with the L.C.C. can only be made valid and binding by Act of Parliament, and some can only be complied with by the companies after the repeal of the statutory prohibition of amalgamation. The Second Schedule, therefore, will only become operative after the passing of the two Bills into law.

To consumers in the London companies' areas the sliding scale is the most interesting part of the proposed

arrangement. Its immediate effect upon prices is not expressed, but is implied by the cessation of the recent practice of putting large sums to reserve out of revenue, against the contingency of compulsory purchase in 1931 on the terms of the 1888 Act. One might make an estimate of the total amount by an examination of all the company's accounts and balance sheets for the last two or three years against the provisions of the sliding scale; but until the necessary valuations, &c., set out in agreements are completed, such an estimate can be but tentative. There is reason to suppose that it will be a considerable total, as we stated in our recent article on the London Bills and the Labour Party's memorandum. As the Bills have yet to pass the second reading and Committee stages in the Commons, and as the opposition of the Labour Party is reported to have led to negotiations for some modification of the terms for the extension of tenure, no one can say at present what will be their ultimate form, or whether they will be passed this session.

Apart from the matter of the companies' tenure, the effect of the alterations made to the Draft Order is that there is no definite technical scheme imposed on the Joint Authority, and that the local authority undertakers will be under no control from the Authority. It may advise and recommend, and its views on any applications for permission to extend stations, &c., will no doubt have the attention of the Commissioners. This may be altered after the Joint Authority has reported upon the suggested technical scheme, and the Commissioners have decided what directions to give, but it appears that a supplementary Order, giving the Authority greater powers, may be necessary to compel co-ordination of the local authority undertakers.

There are numerous consequential alterations in the Order as made, compared with the Draft Order, and some minor alterations are necessarily omitted from this summary.

The Order has yet to receive the confirmation of the Minister, and to be approved by resolutions of both Houses of Parliament. In each of these stages it may be modified. It will come into operation as soon as it has Parliamentary approval, excepting the Second Schedule, which requires the enactment of the two London Electricity Supply Bills.

The Order as "made" may therefore not be the final form which will receive authority, and the dates at which it will become either partly or wholly effective are at present uncertain.

Correspondence.

Correspondents should forward their communications **at the earliest possible moment.** *No letter can be published unless we have the writer's name and address in our possession.*

Hindrances to Electrical Development.

The correspondence in your columns on domestic installations is apparently reaching fundamentals, which all good correspondence should do. The real crux of the matter has been revealed in the letter of "A.W.H.S.," wherein he states: "If a consumer is really anxious to use electricity for purposes other than lighting, the cost of an extra circuit would not prevent him taking advantage of a cheap heating rate through a separate meter." Now, the class of business the electrical industry is after is in connection with the individual who is *not* really anxious about anything electrical, and it is to this class that efforts must be directed. In the present system of charging for energy there are so many methods adopted that it is somewhat difficult to generalise; but it may be assumed that, generally speaking, the rate for heating purposes is much lower than that for lighting. This, of course, involves separate circuits and meters, &c. In many districts the maximum demand method is adopted for lighting and a flat rate for heating; and great has been the surprise of unwary consumers on the receipt of the account for energy the month following the use of an electric iron or kettle, plugged from the lighting circuit as advised by the appliance manufacturers. The demand indicated by even an electric iron very often exceeds the whole lighting demand, and when used in addition to the lighting the demand is more than doubled—perhaps for one hour's use per week. What is the remedy? A separate circuit with a separate set of meters, with wiring costs and meter rent for one flat iron? No wonder the electrical industry is experiencing some difficulty in bringing these very real conveniences to the full use to which they are properly entitled. Our friends the enemy supply gas to stoves and lighting through one meter at a flat rate; this I opine is a method of charging that must be made optional to every consumer of energy for domestic purposes, with a possible limit of, say, 2 kW.

Finally, may I say that it is somewhat deplorable that the method of converting electrical energy to heat for domestic and other purposes is essentially the same as 30 years ago? Had our heating apparatus the same efficiency as our lighting there would be no need to direct our efforts in convincing the sceptical; all such efforts would be needed to keep the queue in order.

Wm. G. Brown.

London, *July 29th*, 1924.

Pulverised Coal.

In the eighteen twenties George Stephenson proposed making a steam locomotive to draw passenger carriages at a speed of twelve miles per hour. Contemporary records indicate the amount of ridicule poured upon this innovation by many "eminent engineers" of the day, one of whom hoped "that he might not be confounded with those hot-brained enthusiasts who maintained the possibility of carriages being driven by a steam engine on a railway at such a speed as twelve miles per hour." The "Rocket" subsequently developed a speed of twenty-nine miles per hour.

Stubborn ridicule is just as prevalent to-day as it was one hundred years ago, and I, personally, experienced just such a deprecatory remark at the World Power Conference, a remark made by, I am thankful to say, an "eminent British engineer."

The continued correspondence in the technical Press about the "ash fallacy" in connection with the burning of pulverised fuel under steam boilers is, in my opinion, only wasting valuable space, for the vicious circle is making its appearance.

Just as the "Rocket" confounded the critics of its day, so will the plant increase for 5,000,000 tons capacity per annum of pulverised fuel during the past year or so, the outstanding bids for, perhaps, £2,000,000 worth of further plant in America, the orders now placed for several stations in Great Britain, and the unpreventable introduction of this "innovation" into the iron and steel industries, prove to be self-evident confirmation of the claims reasonably put forward for the burning of fuel in pulverised form.

That progress in Great Britain in this direction can not be stifled is plain when one considers that two of our engineering "household names" are irretrievably committed to the courage of their convictions, else would they not have undertaken this doubtful process—I refer to Messrs. Vickers, Ltd., and to Messrs. Babcock & Wilcox, Ltd. Moreover, progress in this direction and in the cause of general fuel economy is now likely to grow apace for, to use a Cabinet Minister's recent expression, "the wily politician" is likely to lend a hand.

If the "ash" from a boiler stack when pulverised coal is used is bound to be a general nuisance, then one might reasonably ask why the Hammersmith plant has not been shut down? That a stoker-fired boiler plant can be a very decided nuisance in the discharge of grit from the boiler stack is on evidence in the injunction obtained of recent years against one of the London Borough Councils.

No, Sir, conscientious advocates of the use of pulverised fuel have sufficient consolation in the fact that time alone can be the means of either converting or eliminating the obstructionist disbeliever, for this has been the experience through all the ages.

Leonard Harvey.

London, *July 31st*, 1924.

Electricity v. Gas.

From time to time the argument has been brought forward by gas engineers that for heating and cooking purposes electricity could never become universal on account of the low overall thermal efficiency of present-day generating plant.

This statement leads one to infer that either the overall heat efficiency of gas producing plant, taking into account the efficiency of conversion of gas into heat energy at the consumer's premises, is much higher than 15 per cent.; or that from the financial point of view, with due consideration for the by-products obtained, a gas undertaking is a much better commercial proposition than an electricity undertaking. What, as a student, I wish to ascertain is:—

(1) The average station thermal efficiency of gas producing plant equivalent in size to a 10,000-kW plant; this efficiency being the ratio of the heat value of the gas produced from 1 lb. of coal to the heat value of 1 lb. of coal?

(2) The approximate efficiency of a modern gas fire (with flue) expressed as the ratio of the output of heat into the room (*i.e.*, useful output) to the corresponding heat value of the gas input?

(3) Why, with the presumably better efficiency, a certain gas undertaking does not charge less than 8½d. a therm when electricity can be purchased at 1d. per kWh?

These figures are those obtaining during the summer quarters in the Ilford district. To my knowledge both the gas company and municipal electrical undertaking make good

profits. At the prices of 8½d. per therm and 1d. per kWh, it is as cheap to cook by electricity as by gas.

I should be glad if any of your readers could give information.

L. F. Ryland.

Goodmayes, *July 28th*, 1924.

The Ordinary Member of the I.E.E.

The letter from "A.M.I.E.E." in your issue of the 18th inst. should serve a useful purpose by calling attention to the manner in which our affairs are administered.

The official excuse for not inviting us, as ordinary members of the Institution, to participate in the festivities—if they may be so called—arranged in honour of our oversea guests, was that the numbers to be dealt with were likely to be large. This argument appears to have been sheer nonsense.

The conversazione was this year a comparative failure, owing to the lukewarm nature of the invitations extended to the members, and I have not seen so small an attendance for many years.

The luncheon was certainly not overcrowded, and the arrangements for this, and especially for the reception preceding it, left very much to be desired.

The Kelvin Centenary banquet, although ostensibly an I.E.E. function, had apparently to be organised by an outside source to which even our cheques had to be sent.

Altogether, our rulers showed a lamentable lack of both tact and organising ability, and the ordinary member must find what consolation he can in a close study of our next balance sheet to ascertain—if possible—how, and by whom, and to what extent his money has been spent.

Member.

July 28th, 1924.

The Retail Wireless Trade.

Could you spare a little of your valuable paper for the purpose of drawing attention to the ridiculous state of the wireless trade?

This last week alone I have been in a barber's shop where I was offered wireless sets and components (retail), a music shop, and on Sunday I noted a sweet-shop with a part of the window given away to wireless; this particular business, by the way, was opened on Sunday for tobacco, sweets, &c., so why not the wireless side of the business?

Where is the justice or the sense in these people being able to get their supplies on the same terms as *bona-fide* electricians? It makes one ashamed and disgusted to realise that there are people in the business who are prepared to put supplies over to them.

I quote the barber, music dealer, and confectioner because they were selling well-known goods, and could give a more varied list if unmarked goods were included, not forgetting the second-hand dealer who has a stock of brand new crystal sets (purchased from the maker direct) and who is going to give loud-speaker demonstrations in the near future outside his place.

The phrase "a second-hand gramophone" is often heard with reference to wireless, and only careful handling of the goods you are selling and more careful handling of the customer who has that idea, will suffice to keep the wireless trade on its feet when the novelty has worn off; and I am afraid that these get-rich-at-anyone's-expense people are going to set us a colossal task.

Sydney Perkins.

Leeds, *July 21st*, 1924.

Electrically-driven Centrifugal Pumps for Town Water Supply from Deep Wells.

I should be glad to hear from any of your readers who have had experience of a vertical pumping plant working under approximately the following conditions:—

Depth of well, 100 feet.
Diameter of well, 6 feet.
Total head on pump, 200 feet.
Output, 1,000 gallons per minute.
Variation of water level in well, 40 feet.

C. W. Jackson,
Borough Electrical Engineer.

Corporation Electricity Department,
King's Lynn, *August 1st*, 1924.

Insulating Tape.

Your correspondent, Mr. A. J. Collins, has confirmed the view we have expressed for the last thirty years, *i.e.*, it is absurd to purchase adhesive tape by weight unless there is a guaranteed length per lb.

Surely a tape is obviously faulty when lead foil or sealed tins are necessary to prevent its losing its adhesiveness.

The tape sold under our registered trade mark—"Blackley Tape"—has a guaranteed length per lb.; there is no lead foil, and no cardboard centre to add weight.

Connolly's (Blackley) Ltd.,
W. T. TRAVIS,
Manchester, *July 29th*, 1924. *Managing Director.*

Business Notes.

Bankruptcy Proceedings.—C. G. HOFMAN (trading as W. J. Chambers & Co.), Andrew Works, Cowthorpe Road, Wandsworth Road, and 7a, Victoria House, South Lambeth Road, London, wireless components manufacturer and electrical engineer.—Receiving order made on July 25th on debtor's own petition. First meeting, August 13th; public examination, November 14th, both at Carey Street, W.C.2.

A. W. MATTHEWS AND F. G. MATTHEWS, trading as the Electrical, Gas and Engineering Co., 130, Main Road, Handsworth, Sheffield.—Receiving order made July 24th on debtor's own petition.

F. J. PEARSE, 204, Brixton Hill, S.W., lately carrying on business as a maker of electric light fittings at 38, Beauchamp Place, Brompton Road.—First meeting, August 12th; public examination, October 21st; both at Carey Street, W.C.2.

F. K. SEYMOUR, 16, Aberfan Road, Merthyr Vale, Glamorgan, engineer, electrician, and kinema lessee.—Receiving order made July 24th on debtor's own petition.

G. E. HARRIS, plumber and electrical engineer, 14, North Street, Emsworth.—First and final dividend of 3s. 8½d. in the pound, payable August 11th at 20, Pearl Buildings, Portsmouth.

H. ROGERS, electrical engineer and contractor, 11, Grosvenor Street, Chester, carrying on business in Warrington, Lancs.—First dividend of 2s. in the pound, payable August 12th, at 31, Bold Street, Warrington.

C. W. STOCKEN and C. FINK, carrying on business as the Wyndham Radio Supplies, 80, Redcliff Street, Bristol. Last day for receiving proofs for dividend August 15th. Trustee, Mr. J. P. Emett, 18, St. Nicholas Street, Bristol.

H. P. TUCKER, electrician, Empire Bungalow, Ellacombe, Torquay.—First and final dividend of 20s. in the pound, with interest at 4 per cent., payable August 15th at 23, Fleet Street, Torquay.

J. BURKETT, electrical engineer, 185, John Clay Street, and 78, Anderson Street, South Shields.—Receiving order made July 29th on debtor's own petition.

J. COWAN, merchant of electrical appliances, 35, Dickinson Street, Manchester (residing at Deganwy, Carnarvonshire).—Receiving order made July 29th on debtor's own petition.

H. H. E. LEE (since deceased), electrical engineer, late of 1, Lower Downs Road, Wimbledon.—Trustee, Mr. T. Gourlay, Official Receiver, 29, Russell Square, W.C.1, released July 2nd.

SALVATORE SCARFI, cycle, gramophone and wireless agent, trading as Scarfi Bros., at 78, Alexandra Road, Newport, Mon.—Trustee, Mr. E. H. Hawkins, 4, Charterhouse Square, E.C.1, appointed July 29th.

S. HOLMES, electrical engineer, 5, Gibson Street, Burmantofts, Leeds.—Receiving order made July 28th on debtor's own petition.

L. N. STRIBLING and A. E. SETTERFIELD, carrying on business at 17, Market Place, Margate, as Stribling & Setterfield, electrical engineers.—Receiving order made on July 30th on debtors' own petition. First meeting, August 9th, at the Official Receiver's Office, 10, Burgate Street, Canterbury. Public examination, August 23rd, at the Guildhall, Canterbury.

C. J. HAXBY and E. BRADY, trading as Haxby & Brady, electrical engineers, at 1a, East Parade, Harrogate.—Trustee, Mr. D. S. Mackay, Red House, Duncombe Place, York, released June 30th.

Company Liquidations.—TINGEY WIRELESS, LTD., radio apparatus manufacturers and engineers, 92, Queen Street, Hammersmith, London, W.—Pursuant to Section 188 of the Companies (Consolidation) Act, 1908, a meeting of the creditors of this company was held on August 1st at the offices of Messrs. Lord Foster & Co., 37, Walbrook, E.C., when the chair was taken by Mr. A. J. Foster, F.C.A., the liquidator. A statement of affairs showing the position as at July 14th last was presented, showing liabilities, expected to rank, of £1,015, of which £885 was due to unsecured creditors and £131 represented the unsecured portion of the claim of creditors holding security. The assets amounted to £1,216, but these assets were subject to the claims of the debenture holders amounting to £2,062, so that there were no assets available to meet the claims of the trade creditors. A deficiency account which had been prepared showed that for the year ended September 30th, 1923, there had been a loss on the trading for the

year of £3,717, while for the nine months to June 30th, 1924, there was a loss of £3,208, or a total of £6,925. To this had to be added the estimated losses on realisation of the assets, &c., bringing up the total of the deficiency account to £11,862. The chairman reported that the company was incorporated on October 30th, 1922, with the object of adopting an agreement between Robert Tingey and the company for the purpose of carrying on a wireless and electrical business at 92, Queen Street, Hammersmith. The consideration for the sale was 4,700 shares of £1, the assets being £7,360, of which £3,000 was represented by goodwill. The liabilities, on the other hand, amounted to £2,660, which gave a net figure of £4,700 for the shares which were allotted; there was no cash consideration. Subsequent to that date the share capital was increased to £10,000 by the allotment of 4,801 shares for cash, the subscribers being Major Nathan £2,300, Mr. Blencowe £2,000, and Mr. Sutton £500. There were also issued 500 shares to a Mr. Graydon, who was a gentleman engaged in the service of the company. In the first year the trading resulted in a turnover of £11,000 for the period and there was a gross profit of £2,700. Heavy advertising, however, had to be undertaken in order to keep the company's goods before the public notice. The second audit up to June last showed a loss of £3,200. If the creditors took into account the £3,500 and the shares issued for the services of Mr. Graydon, it brought the existing original capital to more than £10,000. The money had been lost clearly as the result of bad trade. The chairman then came to the question of the debentures. He said that by the articles of association the company was entitled to borrow money to such an extent as was required, and in accordance with this power on May 30th, 1923, the company, wanting money, induced outside friends to provide £2,000 in order to carry on the business. The debenture moneys were paid over to the company on June 2nd, 1923, following a minute of a board meeting. There was, said the chairman, no mention here of any contra or set-off for these debentures, and it seemed quite clear that the legal provisions that were requisite had been complied with. The debentures were issued to Mr. Ward Higgs, a solicitor, and Mr. William Tingey, the grandfather of one of the directors. The chairman added that the position so far as the unsecured creditors were concerned seemed hopeless, and there could be no likelihood of their receiving any dividend in respect of their debts. Mr. Wells, representing creditors, asked for information as to where the money had gone, as he said there had been tremendous losses by this business. The chairman pointed out in reply that the company had spent nearly £2,000 on advertising alone. Mr. Wells asked whether they could not induce the debenture holders to withdraw their claims and rank *pari passu* with the trade creditors. Mr. Lord, the receiver, said in reply that the point could be submitted to the debenture holders, but of course it could not be said whether they were likely to agree to such a proposal, indeed, the probability was rather the other way. Mr. Wells pointed out to the directors that in this case they had turned the business into a limited company and by the issue of debentures the claims of the trade creditors had been entirely defeated. Mr. Wells added that there was no use in blinding oneself to the fact that the wireless trade had got a "stinking rotten name" of late, and some of the big suppliers of the company had got so fed up with it that they had openly declared that they were going to combine to rid the trade of such unworthy representatives. A lot of men had gone into the wireless business thinking they were going to make a fortune out of it, but in many cases, as in this case, the sales organisation was thoroughly bad. The representative of the British Broadcasting Company creditors for £237 said that the company had, he thought, been most generous in this case and had let the company go on, only now to suffer an entire loss so far as its own debt was concerned. No resolutions were passed and the matter will, therefore, remain in the hands of Mr. Foster as liquidator. The following are creditors:—

	£		£
British Broadcasting Co., Ltd....	237	Western Electric Co.	66
Bertram Day & Co., Ltd. ...	97	General Electric Co., Ltd. ...	44
Service Company (London), Ltd.	80	Edison Swan Electric Co., Ltd....	27
Alfred Graham & Co.	74	Siemens Bros. & Co., Ltd. ...	23
American Hard Rubber Co (Britain), Ltd.	44	Micanite & Insulators Co., Ltd.	20
		Creditors for amounts under £20	168

Scholey & Co., Ltd., electrical and mechanical engineers, Victoria Street, S.W., and Croydon.—In pursuance of the Provisions of the Companies (Consolidation) Act, 1908, a meeting of the creditors of the above was held on July 31st at the Caxton Hall, Westminster, S.W., when the chair was occupied by Mr. G. Smith, who stated that he had been appointed to act as the liquidator in the voluntary liquidation. No statement of affairs was submitted, but the liquidator said that there were no assets available for distribution amongst the unsecured creditors. The assets of the company were absorbed by first and second debentures.

The liquidator went on to say that the company was formed on October 5th, 1911, with a nominal capital of £21,000, divided into 20,000 preference shares of £1 each and 20,000 ordinary shares of 1s. each. On August 22nd, 1918, the capital was increased to £36,000 by the creation of a further 15,000 £1 preference shares.. On January 24th and on June 7th, 1922, the company issued two series of debentures. The first debentures were issued to secure £4,800, and carried interest at the rate of 3 per cent. per annum above bank rate, whilst a second debenture was issued to secure £11,200, and carried interest at the rate of 1 per cent. per annum above bank rate, with a minimum of 5 per cent. per annum. In or about the month of November, 1923, Messrs. Clench & Wilkins were appointed receivers for and on behalf of the first debenture holders, and Mr. Wilkins alone was appointed receiver on behalf of the second debenture holders. The receivers continued to carry on the business of the company until May 9th, 1924, and on May 29th, 1924, they gave notice to the company that they had sold the assets for £6,250 after having previously expressed their intention to do so unless a better offer was forthcoming. The purchase money therefore was not sufficient to pay more than a small dividend to the second debenture holders after satisfying the claims of the first debenture holders, and consequently there would be nothing for the unsecured creditors or shareholders.

The liquidator added that with regard to the trading of the company it would appear that for the 12 months ended September 30th, 1919, there was a profit of £2,631, and a dividend amounting to £1,591 was paid in respect of that period. The balance of £1,040 was carried forward. For the 12 months ended September 30th, 1920, the company made a profit of £3,743, so that, with the balance in hand, £4,782 was available for distribution as dividend. The next 12 months also showed a profit of £1,571, after adding the amount carried forward the previous year. If that amount was not included there was a loss of £941. No dividend was declared in respect of that period. After that year the company appeared to have been burdened with heavy stocks. Owing to the slump in trade the turnover fell considerably, and it was impossible to realise the stock without heavy losses. Between October, 1921, and December, 1922, the company was engaged in the development of car lighting, &c., and large sums of money were spent, and the trade was carried on under great difficulties, and for months the directors made every effort to make a success of the business, but without success, and the patent rights were disposed of at a considerable loss. No discussion took place, and a resolution was passed confirming the voluntary liquidation of the company, with Mr. Smith as liquidator.

Radio Gramophones, Ltd.—Winding up voluntarily. Liquidator, Mr. L. W. Millar, C.A., 10, Coleman Street, E.C.2. A meeting of creditors is to be held to-day (Friday) at the liquidator's offices.

Wireless Equipment, Ltd.—Winding up voluntarily. Liquidator, Mr. H. H. Foster, 806, Salisbury House, E.C.2. Meeting of creditors at this address on August 13th. Particulars of claims to be sent to the liquidator by September 18th.

Radieco, Ltd.—Winding up voluntarily. Liquidator, Mr. C. L. D. Duff, Norwich Union Buildings, High Street, Chelmsford. Meeting of creditors, August 11th, at the offices of the liquidator. Claims were to be sent in by August 7th.

Electrical Cabinet Works, Ltd.—Meeting of creditors at the office of the liquidator, Mr. A. C. Heyward, 14-15, Coleman Street, E.C.2, held on August 7th. Particulars of claims are to be sent in by September 7th.

Metropolitan Electric Wire Co., Ltd.—By an order of the High Court, dated July 18th, a committee of inspection consisting of Mr. H. E. Burgess, Senior Official Receiver and Liquidator (chairman) and representatives of Messrs. H. C. Rowland & Co., Ltd., Messrs. White, Jacoby & Co., Ltd., and Cables & Electrical Supplies, has been appointed.

Dissolutions of Partnership.—Hewson & Lown, electrical and general engineers, 22, Noel Street, Oxford Street, W.1.—Messrs. F. T. Hewson, H. V. Lown, and A. J. F. Craufurd have dissolved partnership. Mr. Hewson will attend to debts and continue the business under the same style.

Bearwood Motor and Engineering Co., radio and general engineers, Bearwood Road, Smethwick, Staffs.—Messrs. B. C. Brazier and S. N. Davies have dissolved partnership.

Gowan Bros., electrical engineers, 1, Amersham Hill Avenue, Amersham.—Messrs. G. C. Gowan and T. Budgett have dissolved partnership. Mr. Budgett will attend to debts.

Deed of Assignment.—H. G. Cayless, electrical engineer, trading as Cayless & Potter, Tudor Chambers, Station Road, Wood Green, N. Particulars of claims to be sent to the trustee, Mr. W. A. J. Osborne, Balfour House, Finsbury Pavement, E.C.2, by August 16th.

Private Arrangements.—H. L. Rayner, trading as L. B. Tickle & Co., 61, Borough Road, London, S.E., dealers in wireless and electrical goods.—The creditors interested herein were called together recently, at the Society of Incorporated Accountants, Gresham Street, E.C., when a statement of affairs was submitted which had been prepared by Messrs. Temple, Gothard & Co., 4/6, King Street, E.C. The statement disclosed liabilities of £1,881. The assets were estimated to realise £1,511, or a deficiency of £370. It was stated that in all the debtor had put between £4,000 and £5,000 into the concern, and the money had been lost in trading. A resolution was passed in favour of the matter being dealt with under a deed of assignment, with Mr. W. A. J. Osborne, of Messrs. Corfield & Cripwell, accountants and auditors, Balfour House, Finsbury Pavement, E.C., as trustee. A committee was also nominated consisting of Mr. E. J. Lever, and the representatives of the Newington Foundry Co., E. Camelinat & Co., Ltd., Phillips & Hine, and Ebonestos Insulators, Ltd.

H. C. WOODHALL AND S. M. ROWLANDS, trading as the Woodhall Wireless Manufacturing Co., 55, Cardington Street, London, N.W.1.—A largely-attended meeting of the creditors of the above was held on July 31st, at the debtor's premises, when the representative of Messrs. W. H. Briscoe, the principal creditors, was elected to the chair.

A statement of affairs was presented which disclosed liabilities of £3,430, made up as follows: Sundry creditors, £2,831; loans, £400; and bank overdraft, £199. The total assets are £2,481, leaving a deficiency of £948. The business was commenced in partnership on May 1st, 1923, with a capital of £450. Neither of the partners possessed any separate estate. During the first three months the sales totalled £614, whilst in the second quarter they were £1,821, and during the third quarter £2,628. During the fourth quarter the sales increased to £3,991, but since May 1st last they had fallen to £2,285. Accounts were prepared for the 12 months ended April 30th last, and they showed that during the year the purchases totalled £7,412, whilst the sales amounted to £9,996. There was a gross profit on the trading of £3,854, but after allowing for the expenses there was a net profit of £462 before deducting the partners' drawings. The debtor Woodhall drew £800, whilst Rowlands drew £299. The accounts for the first year also showed that both the partners, after allowing for the drawings, had a capital in the business, whilst the goodwill was set down at £319.

Mr. P. Houstoun, of Messrs. Corfield & Cripwell, said the business was solvent at the end of the first year's trading, as the partners' capital accounts were in credit to the extent of over £330, and he inquired how that surplus had disappeared and the present deficiency been created.

Mr. Woodhall replied that the deficiency had been brought about by depreciation written off the stock and book debts. He pointed out that it was the lean season for the wireless trade, and whilst the profits in the business had fallen off the expenses had remained. The stock had been depreciated to the extent of £500.

Mr. Houstoun remarked that he was not aware that there had been any fall in the price of wireless goods during the last few months, but a creditor declared that certain goods had depreciated by 15 per cent. since April.

In answer to a question it was stated that no figures showing the trading had been prepared since May 1st last.

The position was discussed at some length, and eventually it was decided that a deed of assignment should be executed to Mr. E. H. Hawkins, of Messrs. Poppleton, Appleby and Hawkins, 4, Charterhouse Square, E.C., with a committee of seven of the principal creditors.

A. J. CUSTANCE, trading as A. Custance & Co., 18, Old Bedford Road, Luton, electrical and general engineer.—A meeting of the creditors in this matter was held on July 31st at the offices of Messrs. Ansell & Jones, 32, King Street, Luton, when Mr. A. E. Ansell presided. A statement of affairs was presented which showed net assets of £85 and a deficiency of £207. Mr. Ansell stated that the meeting had been called because there were two judgments against the debtor. He started business on January 1st, 1920, with others. The first year there was a profit of £44, the second year a loss of £85, and the next year a loss of £93. At the end of December, 1922, all the capital had gone and the others retired. The debtor had merely been doing odd jobs and had been working for nothing at all. He had no shop at all. After some discussion it was agreed to accept the debtor's offer of a secured composition of 5s. in the £, spread over six months. The following are creditors:—

	£		£
Sun Electrical Co., Ltd.	78	Ansell & Jones	13
Falk, Stadelmann & Co.	36	Foster Engineering Co.	43
Joyce, T. & H.	22	Drake & Gorham	14
Gibbs & Dandy	13		

JAMES BERTY RENSHAW, wireless specialist, 17, Old Chapel Street, Blackburn.—A meeting of the creditors was held recently, at Manchester, when a statement of affairs was presented which had been prepared by Mr. T. Eccles, accountant, of 25, Richmond Terrace, Blackburn. The statement disclosed ranking liabilities of £1,416, all due to unsecured creditors. The net assets were estimated to realise £780, or a deficiency of £636. It was stated that the liabilities might be increased by about £100. The debtor had not kept a full set of books, and could not give a detailed explanation showing how the present deficiency had arisen. The debtor started the present business in September, 1922, with little or no capital. He had previously been in a partnership, but there was a dissolution. The bank pass book showed that the payments in during the past six months had been approximately £3,000, whilst the drawings had been at the rate of £4 10s. a week. A resolution was passed confirming the deed of assignment already executed to Mr. Eccles, with a committee. The following are creditors:—

	£		£
Clark & Co., Ltd.	205	Fuller's United Electric Works, Ltd.	70
Ward & Goldstone	178	White, J. C.	50
Marsden, John	136	Royal Accumulator Co.	36
Northern Radio Co.	89	Ashby Wireless Co., Ltd. ...	34
Victoria Electrical Co.	85	Electrical Supplies Co.	266
Siemens Bros. & Co. Ltd. ...	81		
Kershaw & Co.	50		

Annual Holidays.—The following works will re-open on Monday, 11th inst., after the summer holidays. The works of the Vincent Switchgear Mfg. Co., at Birmingham; the Colindale works of Everett, Edgcumbe & Co., Ltd.; the works of the London Electric Firm, and the Electric Heating Co. at Croydon.

Trade Announcements.—Messrs. W. SISSON & CO., LTD., of Gloucester, have appointed as their London representative Mr. A. Fleming Browne, M.I.Mech.E., &c., of 11, Carteret Street, Queen Anne's Gate, London, S.W.1.

Messrs. G.W.I., LTD., have removed their offices to 43, Grafton Street, Tottenham Court Road, London, W.1.

THE BRUSH ELECTRICAL ENGINEERING CO., LTD., has transferred its Cardiff office to 22, Dumfries Place, Cardiff. The telegraphic address and telephone number are unaltered.

Sequestration.—The estates of A. THOMSON & CO., electrical and mechanical engineers, 69, Brown Street, City, Glasgow, and ADAM THOMSON, the only known partner of the firm, were sequestrated on July 29th by the Sheriff of Lanarkshire. A meeting to elect a trustee and commissioners is to be held at the Faculty Hall, St. George's Place, Glasgow, on August 12th, when a composition may be offered.

Catalogues and Lists.—THE FOSTER ENGINEERING CO., LTD., Morden Works, Wimbledon, S.W.19.—A blotter advertising "Apex" ironclad switch and fuse gear, and a leaflet dealing with "Crown" cables.

THE PREMIER TIME SWITCH CO., 67, Elgin Mansions, Elgin Avenue, W.9.—Price Sheet No. 200, describing an automatic time-switching device.

MESSRS. SANTON, LTD., 34, Bridge Street, Newport, Mon.—A pamphlet describing the "Santon" electric geyser. Priced.

MESSRS. GEORGE ELLISON, Perry Barr, Birmingham.—List No. 431, illustrating and describing cable fittings of numerous types—joint boxes, armour clamps, &c.

THE GENERAL ELECTRIC CO., Schenectady, N.Y., U.S.A.—A brochure illustrating a number of examples of the company's products.

MARCONI'S WIRELESS TELEGRAPH CO., LTD., Marconi House, Strand, W.C.2.—Leaflet No. 1,031, illustrating and describing Marconi 500-W pack radio stations.

THE STERLING TELEPHONE & ELECTRIC CO., LTD., 210-212, Tottenham Court Road, W.1.—Publications Nos. 373B, 374B, and 394, dealing respectively with "Sterling" radio components, radio telephones, and a 4-valve cabinet receiver. Also a cardboard cut-out of a loud speaker.

THE ARMATURE WINDING CO., LTD., 44a, Bolton Street, Bury, Lancs.—A priced and illustrated publication describing the "Kaybee" electric wash boiler.

THE ENGLISH ELECTRIC CO., LTD., Queen's House, Kingsway, W.C.2.—Publication No. 541, containing a fully-illustrated description of the "Fullagar" opposed-piston oil engine, and generators for use with this engine. Also Publication No. 365, dealing with the "Seewer" governing device for impulse water turbines.

THE MICA MANUFACTURING CO., LTD., Volta Works, Bromley (Kent), S.E.—A leaflet advertising "Micagel," a composition for repairing burned-out commutators.

THE NEW SWITCHGEAR CONSTRUCTION CO., LTD., Sutton, Surrey.—Four illustrated leaflets dealing with oil-break switch pillars, cubicle switchboards, oil-immersed switch-fuses, and isolating links, respectively.

SIEMENS & ENGLISH ELECTRIC LAMP CO., LTD., 39, Upper Thames Street, E.C.4.—August price list of electrical supplies of all kinds—wiring materials, appliances, and accessories.

MESSRS. L. G. HAWKINS & CO., LTD., 30-35, Drury Lane, W.C.2.—An illustrated folder advertising a new "Universal" cooker. Also a leaflet giving prices and details of electric fans and lighting fittings.

MESSRS. SIEMENS BROS. & CO., LTD., Woolwich, S.E.18.—Pamphlet 130A, containing particulars of the "Stannos" wiring system and a number of views of buildings in which it has been installed.

MESSRS. A. J. STEVENS & CO. (1914), LTD., Wolverhampton.—An illustrated price list of valve radio receiving sets, components, and accessories.

THE BENJAMIN ELECTRIC, LTD., Brantwood Works, Tariff Road, Tottenham, N.17.—A brochure entitled "The Source of Correct Illumination," containing lighting data and particulars of typical installations.

Engineers' Wages.—In connection with a demand made by the Amalgamated Engineering Union and about 40 other trade unions in the engineering industry for an advance in wages of £1 per week, a conference of the unions involved was held in London on July 31st. It was decided to form a committee consisting of one representative of each union to consider the statements as to the unsatisfactory condition of the industry made by Sir Allan Smith at an earlier conference, and report thereon to a further meeting of the unions. The Committee is to hold its first meeting on Tuesday next. The chairman is Mr. J. T. Brownlie, of the A.E.U.

For Sale.—The Borough of Torquay Electricity Department has for sale a 500-kW B.T.-H. turbo-alternator and other generating plant, a surface condensing plant, an 800-Ah "Tudor" battery, boilers, fans, pumps, &c. (See our advertisement pages to-day.)

New Municipal Showrooms.—The Liverpool City Council has adopted a recommendation of the Tramways and Electric Lighting Committee that application be made to the Electricity Commissioners for sanction to the borrowing of £18,200 for the purchase of premises in Whitechapel and Button Street for the purposes of electrical showrooms.

Book Notices.—"The Trade, Industries, Products, and Resources of South Africa and Adjacent Territories," compiled by C. W. F. Harrison, F.S.S., F.R.G.S. (543 pp., ill.). Woodchester, Glos.: The Arthurs Press, Ltd. Price 22s. post free.—The preface to the new edition of this work states that it has been completely revised and the statistical matter brought up to date. The new matter, occupying some 130 pp., includes further information regarding the railways and harbours, industries, and municipalities; a classified list of factories and works, &c.

"Illumination," July, 1924. London: Holophane, Ltd.—This number of a quarterly magazine published by the company deals with church lighting. A number of examples are illustrated and described providing matter of interest to those whose aim is to beautify places of worship.

"Official Handbook, 1924." London: The Radio Association.—This contains the constitution and rules of the Association, particulars of membership, &c.

"The *Journal* of the Junior Institution of Engineers," August, 1924. London: Percival Marshall & Co. Price 2s.—Three papers are reprinted in this issue, *viz.*, "Some Notes on Water Power Engineering," by A. Howell; and "Internal Combustion Locomotive Development," by T. Grime; "An Introduction to the Study of Fire Danger in Factories, &c.," by P. M. Fraser, F.R.I.B.A. In addition, there are notes on visits, &c.

"The Technology Reports of the Tôhoku Imperial University." Vol. IV. No. 1. Lendai and Tokio: Maruzen Co., Ltd.

"Report of the Council of the City and Guilds of London Institute for 1924." London: The Institute.

"Catalogue of the College of Engineering, Polytechnic Institute of Brooklyn, for 1924-25." Brooklyn, New York: The Institute.

Stoker Contracts.—We have received a lengthy list of orders recently obtained by the Underfeed Stoker Co. for its travelling grates, ash conveyors, stokers, &c., for electricity and other works in this and other countries.

Wireless Apparatus Trade in Argentina.—A report on the market for wireless apparatus in Argentina has been prepared by the Department of Overseas Trade from information received from the Commercial Secretary at Buenos Aires (Mr. H. O. Chalkley, C.B.E.).

British Empire Exhibition Notes.—Further "literature" drawing attention to its "Electricity in Service" exhibit has been produced by the British Electrical Development Association. This includes a folder (E.D.A. 465), containing a miniature plan of the Exhibition, with a pointer indicating the exhibit, and another (E.D.A. 460) inviting inspection of the all-electric house where "light, heat, and help are on tap."

Mr. J. W. Beauchamp, director and secretary of the Association, informs us that it is estimated that about 10,000 visitors inspect the exhibit each day, and at least half of these are interested enough to ask questions.

Electricity Supply Workers' Wages.—A meeting of representatives of the trade unions involved in the electricity supply industry was held on July 30th to consider the position brought about by the decision of the employés to withdraw their labour unless their demand for 10s. per week increase is conceded. A resolution was passed to the effect that unless negotiations with the employers' representatives proved satisfactory, on August 14th a fortnight's notice of the men's intention to strike would be given.

The employés' side of the London District Council for the industry held a separate meeting on the following day (July 31st), when consideration was given to an offer made by the London employers. After the meeting a statement was made by Mr. W. J. Webb, secretary of the trade union side of the Council, in which no mention was made of the offer, but a decision to act in accordance with the resolution passed at the meeting of the previous day was announced.

The Inquiry into Our Export Trade.—In our last issue ("Notes," page 188) we gave the names of the members of the Committee appointed by the Board of Trade to inquire into and report upon the position and prospects of British industry, with special reference to the export trade, and to make recommendations with regard thereto. We now give a copy of the memorandum which has been furnished to the committee. This memorandum, while not intended to constitute a definition of the inquiry, is intended as explanatory of subjects on which investigation is specially desired:—

The first question to which the attention of the Committee should be directed is the present position of British overseas trade and the prospect of British participation in the markets of the world being such as to ensure sufficient and continuous employment and a satisfactory standard of living in this country. The examination of tendencies and developments in the markets of the world and also in the chief competing countries will be involved, together with an inquiry into the growth of competition with British goods in these markets, the likelihood of its continuance, and its probable consequences.

The second question is the ability of British industry to meet competition under the conditions thus determined and to adapt itself to changes in the nature of overseas demand. This involves an inquiry into British productive capacity and organisation, including the supply and efficiency of capital, labour, and management, the present and future adequacy of raw materials and possible improvements in their utilisation, and the part played by the United Kingdom in new developments of industry, particularly those which are the outcome of scientific research. Matters to which attention might be directed are the present extent of large-scale production, its possibilities and limitations; the efficiency of plant and equipment; power supply and transport as factors in cost of production; marketing organisation at home and abroad; and the current methods of industrial and commercial finance. It will be necessary, in addition, to take account of the effect of State regulative action upon costs and output.

The third question is that of the relations between those engaged in production. This will involve inquiry into methods of industrial remuneration, the main causes of unrest and disputes, and the methods of avoidance or settlement of disputes, as, for example, co-partnership, co-operation, wages boards and voluntary arbitration, State regulation of wages, and compulsory arbitration and compulsory enforcement and extension of agreements.

Large Telephone Exchange Batteries.—The D.P. Battery Co., Ltd., has just received orders from Messrs. Newton Bros., Ltd., of Derby, for two batteries for the telephone exchanges at Gloucester and Newport, the capacity in both cases being 4,993 ampere-hours at the 9-hour rate. Provision will be made so that the capacity of these batteries may be increased to 9,986 Ah and 8,812 Ah respectively. Two smaller batteries, each consisting of 150 cells, are also required for these exchanges. The D.P. Battery Co. has further orders in hand for P.O. exchanges at Birkenhead, Aldeborough, Didsbury, Trafford Park, Leeds, Cardiff, &c.; it is also enlarging batteries at Liverpool, where the cells will have a capacity of 5,193 Ah at the 9-hour rate of discharge.

Lighting and Power Notes.

Birmingham.—Unemployment Relief Schemes.—The Corporation proposes to spend during 1924-25 £1,739,227 for unemployment relief works. This figure includes £134,000 for the completion of certain buildings and structural work at Prince's station, Nechells, comprising extension of engine and boiler house, construction of pond for cooling-water reservoir, extension of canal basin, and construction of an ash bunker, and £20,350 for the construction of an embankment to accommodate the railway siding for a proposed generating station at Ham's Hall. It is also proposed to spend £11,000 upon the relaying of mains consequent upon road works. The Education Committee contemplates spending £11,516 upon the installation of electric lighting in 17 schools.

Brundall (Norfolk).—Electricity Order.—The Electricity Commissioners have submitted a Special Order to the Minister of Transport, for confirmation, giving powers to the Brundall and District Service Co., Ltd., to supply electricity in Brundall and other parts of the rural district of Blofield.

China.—Electrical Development.—The report of the Société de Tramways et Eclairage de Tientsin for last year shows that the net profit amounted to 10,500,000 fr., as compared with 7,875,000 fr. in 1922. The tramway receipts showed an increase of 0.9 per cent., the number of passengers carried being 65,545,000, an advance of 7,760,000 over the preceding year. The receipts from the supply of current for lighting and power purposes improved to the extent of 14 per cent.

Continental.—Esthonia.—It is reported from Riga that a group of British capitalists is endeavouring to secure a concession for the development of the Narval Falls. It is proposed to erect plant estimated to cost £1,500,000.

Italy.—With the completion of new stations under construction in the Sila mountains, Italy will be connected from the Alps to Sicily by a distribution system to which most of the power stations will be able to furnish current, from the Adamello Co. in the Alps, and the Terni Co. in central Italy to the Sila in Calabria, and the Generale Elettrica in Sicily.

France.—The Compagnie Electrique du Nord, of Douai, has secured official sanction to a scheme for the establishment of a branch 15,000-V transmission line in the Guesnain (Pas de Calais) district in order to meet the requirements of the Société d'Interet Collectif Agricole d'Electricité de Cantin, Roucourt and Erchin.

Switzerland.—Under the presidency of the Ministry of the Interior in Berne, a conference has lately been held between the Water Economy Commission and the Electrical Energy Export Committee to discuss a proposed new measure to control the export of electricity from Switzerland, with due regard to the supply for the country itself. It is stated that, generally speaking, the measure was approved by the Water Commission, although it was agreed that certain of the clauses should be referred back for further consideration. During the course of the conference the question of the establishment of long-distance transmission lines also came under discussion. At present such lines are established under regulations as provided by the Electric Low- and High-Pressure Installation Act of 1902. It was considered that the time had come when new legislation on the subject was necessary, and the Minister of the Interior promised to bring the subject to the notice of the Government.

(*Continued on page 221*).

The Post Office Research Station.

The Dollis Hill Establishment.

It is no exaggeration to state that if research could be subsidised on the same scale for a decade of peace as it was during the late years of war, scientific and engineering progress would be beyond conception; though it must be confessed that great social disturbances might follow as a result of the world's unpreparedness to receive and adapt itself to the new conditions.

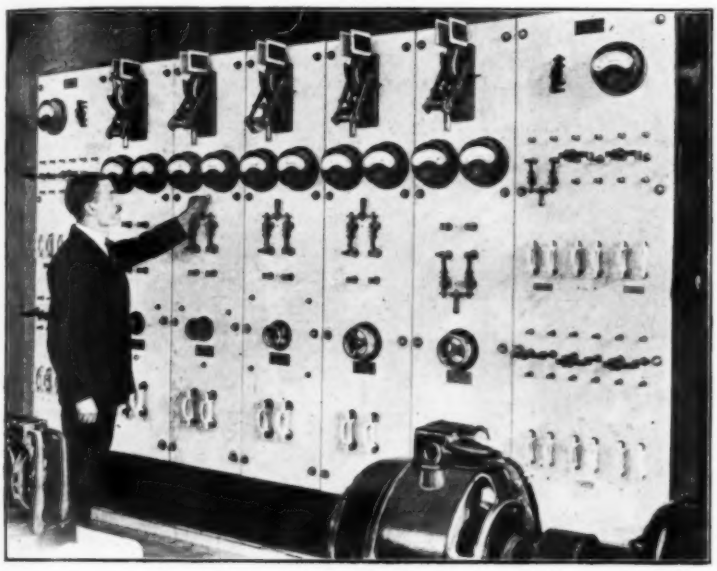

Fig. 1.—Power Distribution Switchboard.

For many years research has played a considerable part in the organisation of the Engineering Department of the Post Office; for instance, between the introduction of the sixpenny telegram rate in 1885, and the inauguration of the experimental section in 1907, improvements in telegraph apparatus which followed a dozen only of the many investigations initiated by the Engineering Department effected an economy in capital expenditure of over £1,250,000, together with an annual saving in excess of £300,000. As time elapsed, however, the work became restricted by accommodation difficulties and following the acquisition of the extensive undertaking of the National Telephone Co. by the Post Office in 1911, it became evident that if the scope of the research work was to be extended more suitable facilities would have to be provided.

Authority for building a new research station was accordingly obtained early in 1914, but the intervention of the European war prevented the scheme being proceeded with. When, however, negotiations were resumed at the conclusion of hostilities for the purchase of the site already chosen, the plans had to be reconsidered on account of the excessive cost of building construction. Meanwhile, the need for increased accommodation had become acute and it was decided that the most expeditious and economical manner of satisfying it was to utilise ex-Army timber hutments, the staff being transferred to the new laboratories from the various Post Office premises in London in October, 1921. The temporary hutments have been placed in one corner of the site so as not to interfere with the erection of the permanent structure according to the original plans, when building costs permit.

The site, which was chosen on account of its immunity from noise, vibration, and electrical disturbance, is about eight acres in area, and is situated on the high ground opposite the northern entrance to Gladstone Park, between Dollis Hill and Neasden. The staff at present numbers 117 scientific and 77 industrial (workshop, &c.) workers. The activities of the station may be gauged from the Engineer-in-Chief's annual report, which mentions that during 1923 tests totalled 634; assuming the number of working days to be 300, that means two highly specialised investigations were completed each day of the year, in addition to which nearly one million tests were carried out on trunk cables during construction.

Although so unpretentious in external appearance, so highly successful has the work of the station been that, outside the U.S.A. and Canada, which follows American practice mostly, the British Post Office standards and standard tests enjoy an almost world-wide reputation, and have been adopted in all the British Dominions, in France, and in many other Continental countries. Moreover, the reports prepared by the staff on the investigations carried out by them are in constant demand by telegraph and telephone administrations throughout the world.

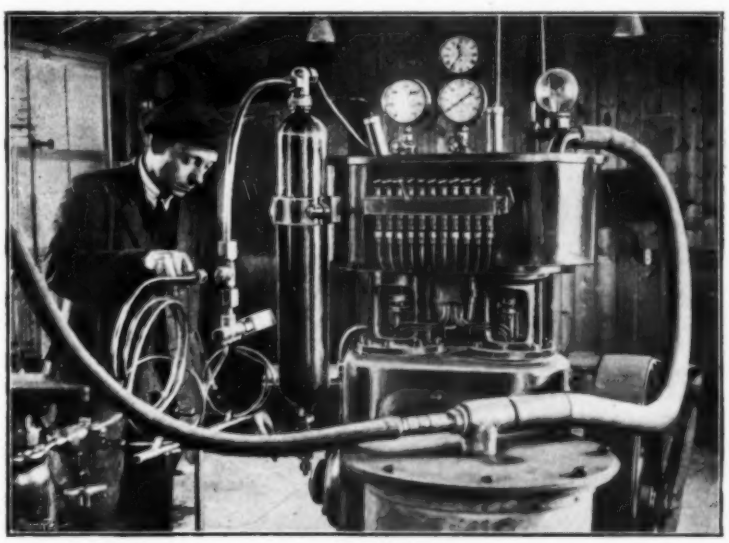

Fig. 2.—Liquid Air Apparatus.

The research section is a branch of the Engineer-in-Chief's headquarters organisation, and is divided into six groups:— (*a*) Trunk telephone research; (*b*) telephone transmission; (*c*) telephone exchange signalling;

(*d*) telegraph; (*e*) physical and chemical; and (*f*) construction. In addition to the office accommodation, drawing offices, a canteen, telephone exchange, and heating apparatus (both hot water and electric radiators), an assortment of machinery provides the laboratory services.

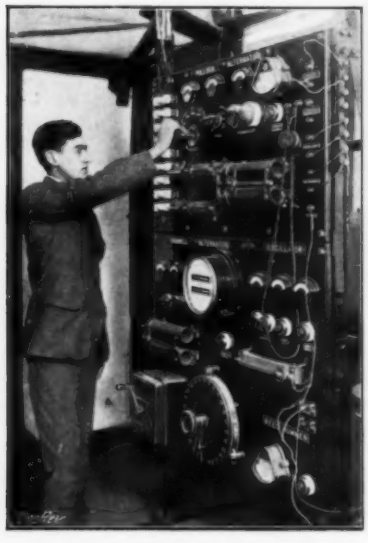

Fig. 3.—Test Room Alternator Control Board.

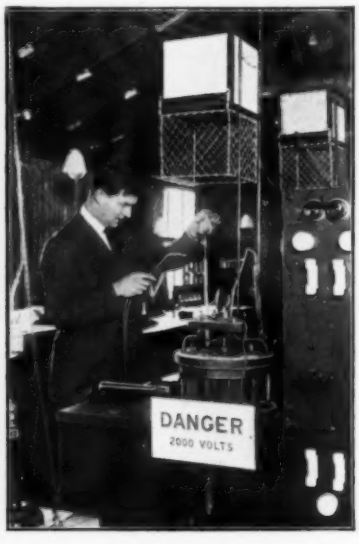

Fig. 4.—Experimental Valve-making Equipment.

For fire extinguishing purposes an electrically-driven pump can be automatically started by remote control from any part of the station. A supply of a.c., 3-phase electricity is purchased from the Willesden Corporation at 3,000 volts, and is transformed on the premises to 480 volts; motor generators furnish d.c. at 240 volts and 60-80 volts, and there is a booster for regulating battery charging. Fig. 1 is a view of the power distribution switchboard. An installation by the British Oxygen Co. produces about one litre of liquid air per hour at a cost of 7d. The plant, fig. 2, is driven by a 15-h.p. motor and compresses air, first, in a l.p. cylinder to 200 lb. per sq. in. and, secondly, in a h.p. cylinder to 2,500 lb. per sq. in. After being cleaned and dried the compressed air passes into a Hampson liquifier, and is expanded and cooled until its temperature falls to that of liquefaction. Liquid air is required for a variety of purposes, but chiefly to assist in the production of high vacua for research work on thermionic valves.

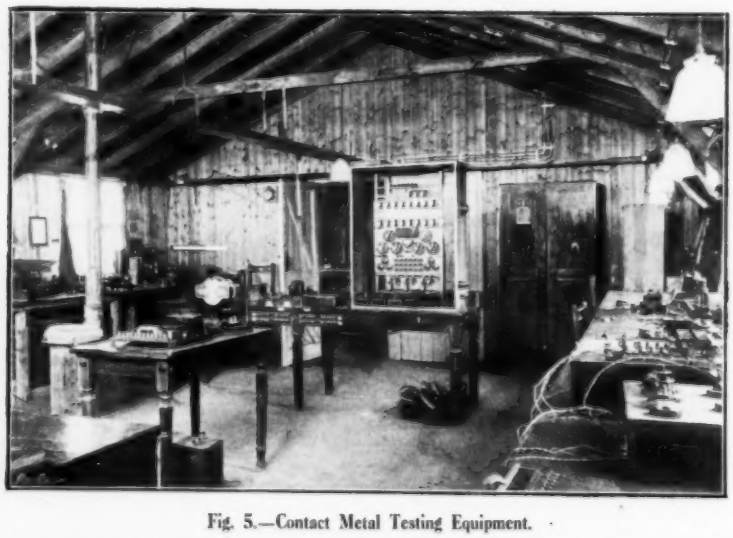

Fig. 5.—Contact Metal Testing Equipment.

A CO_2 ice-making plant is installed as well as a series of compressors for furnishing air for glass blowing, metallurgical furnaces, and acoustical purposes. Other machines supply a.c. at telephonic speech frequencies and also at telephone bell-ringing frequencies for measurement work; fig. 3 shows the a.c. test-room control board for the alternators.

The wood-working and machine shops are equipped with modern machine tools for the construction of research apparatus, and in a garage is carried out the maintenance and repair of the considerable fleet of motor vans, which are equipped as travelling laboratories for the extremely delicate measurements necessary for the balancing and testing of the telephone trunk cables. The coil-winding shop is equipped with Igranic machines for the construction of coils of all types. The high-pressure laboratory is not yet complete, but it is designed for testing insulation and insulating materials and for research work upon lightning protectors.

The laboratories proper consist of a series of huts each 20 by 80 ft. The first is divided into glass-blowing and experimental telephone repeater valve shops, wherein thermionic valves are made in small quantities, the equipment including Gaede & Langmuir pumps, glass bulb-sealing machine (fig. 4 and 6), electric welders, &c. Arrangements are provided for electronic bombardment to release occluded gases, or alternately a high temperature can be produced by the high-frequency h.p., inductive method. The next three huts comprise stores, a metallurgical furnace hut, and a submarine cable-testing hut; the last two have not yet been equipped, but it is interesting to note that although one of them has housed a temporary 500-ampere-hour, 240-cell battery for four years, the galvanised-iron roof shows no trace of corrosion, acid fumes having been prevented from reaching it by the use of a film of pure petroleum on the surface of the electrolyte, which is an extremely efficient way of stopping acid spray.

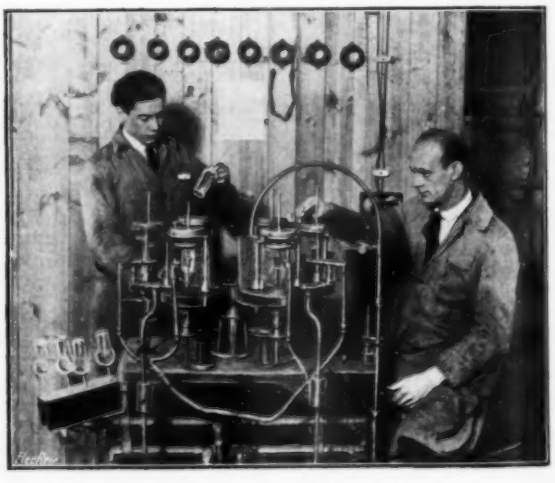

Fig. 6.—Valve-making Machine.

One end of the next hut is assigned to the drawing office for blue printing, while the other is fitted as a studio for photographic apparatus for illustrating reports. The chemical laboratory deals chiefly with the analysis of materials used in the construction of primary and secondary batteries, of which the Post

Office is the largest individual user in the country. Problems of corrosion of cable sheathing and conductors, &c., are also investigated, whilst the metallographic laboratory has been provided with such instruments as a Leitz metallograph for micro-photography, Greenhaugh stereoscopic microscopes, grinding and polishing apparatus, &c. The Mitting colorimeter can be used for measuring and recording the colour of fabric or pigments in paint, and for determining the degree of fading as a result of exposure to light. The work done in this section has included an investigation of the causes of the longitudinal splitting of the lead covering of cables, and the continuous testing (fig. 5) of gold, silver, palladium alloys, with the object of finding a substitute for expensive platinum electrical contacts. Such alloys and most of the small castings needed for the production of special apparatus are made in a separate metallurgical laboratory. A pyrometric installation for the heat treatment of metals, a wire-drawing machine, and devices for testing the strength of materials are being installed.

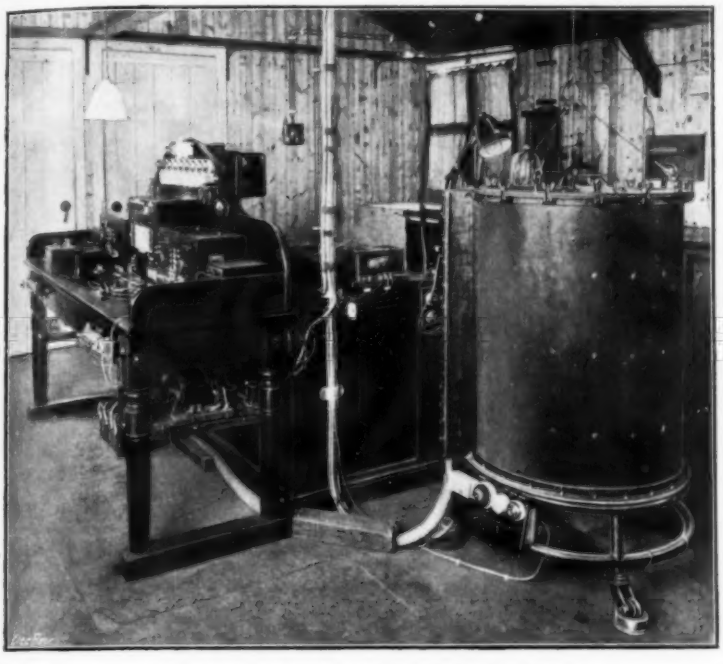

Fig. 7.—Telephone Transmitter Testing Chamber.

Pending the completion of the permanent buildings at Dollis Hill, the greater part of trunk telephone research, including repeater work, is carried out at the Marshalsea Road premises in The Borough, where there are facilities for direct connection to all the main trunk lines. The contribution of the research section to the saving in capital expenditure in this connection during the past few years is reckoned in millions of pounds sterling.

Apparatus for determining the variation in efficiency of telephone transmitters is illustrated in fig. 7. It consists of a steel cylinder holding 100 transmitters to which are applied the varying temperature, moisture, and pressure conditions occurring in normal use. In addition, a synthetic voice, which produces a complex sound with the range of frequencies existing in the human voice, actuates the transmitter at intervals; the conditions of normal usage are reproduced even to the sharp jar to which the transmitter is subjected by the removal and replacement of the receiver on the switch hook. A virtual usage equivalent to 10 years of life can be given in two months, and connections are made to the desk shown in the picture so that any of the 100 transmitters can be compared.

A portion of the laboratory devoted to telephone exchange signalling research is shown in fig. 8, while the transmission efficiency testing desk is shown in fig. 9. Those engineers who deal with transmission also maintain and calibrate apparatus for standards of speech. The standards are specially selected microphones, receivers, induction coils, transformers, and "lines" which can be assembled into circuits and used for directly comparing other apparatus, using speech. The standards are stored in a fire-proof chamber wherein the temperature and atmospheric conditions are maintained uniform by a thermostat.

Fig. 9.—Transmission Efficiency Testing Desk.

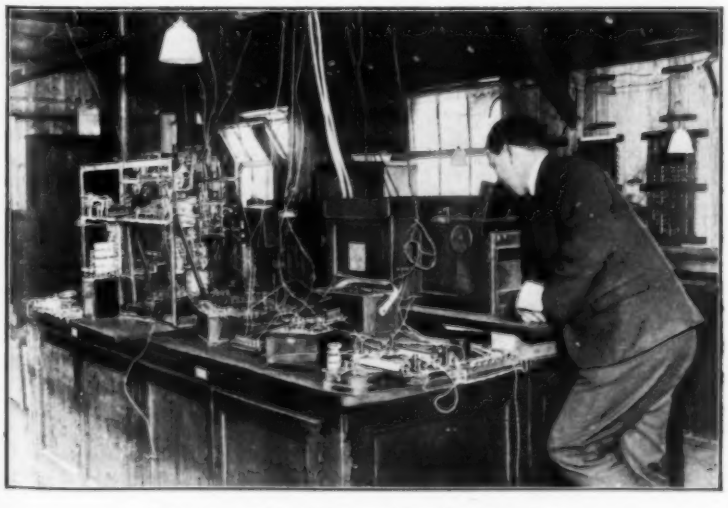

Fig. 8.—Portion of Exchange Signalling Laboratory.

To adequately describe the Dollis Hill research station would require more space than is at our disposal, but sufficient has been written to indicate the magnitude and importance of the work done. In conclusion, we have to thank Col. T. F. Purves, O.B.E., Engineer-in-Chief to the G.P.O., for permitting the above details to be published, and to express our indebtedness to Mr. S. A. Pollock, O.B.E., and to Capt. B. S. Cohen for their assistance on the occasion of our visit to Dollis Hill.

The Cotton Textile Exhibit at the British Empire Exhibition.

The Electrical Equipment.

The successful application of electrical control and driving in the textile trades has provided the electrical engineer with a number of knotty problems during the past fifteen years, but owing to the initiative and energy that have been applied to their solution, involving, it may be said, considerable expensive experimental work, the results have been such that electrical driving, either group or individual, has in the past few years won increasing favour and is well on the way to becoming standard practice.

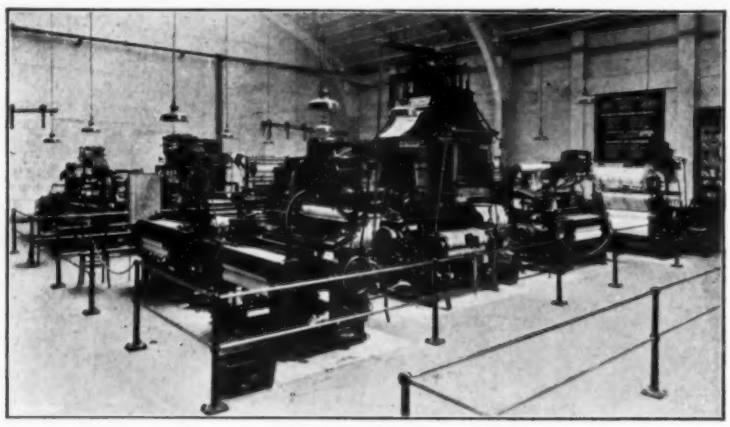

Fig. 1.—General View of the Looms.

What has been accomplished in this direction may be seen in the miniature, though none the less comprehensive, National Cotton Exhibit which is proving one of the most popular features of the British Empire Exhibition. This exhibit owes its success to the energy of Mr. Frank Nasmith, honorary secretary of a committee of the Textile Machinists' and Loom Makers' Associations and a large body of electrical manufacturers, who have had at their disposal the wide experience in the application of electricity to the textile industry of Messrs. J. F. Crowley & Partners, who are acting as honorary consulting engineers.

So far as was possible within the scope of the exhibit, full advantage of their opportunity has been taken by the electrical firms specialising in the control and driving of modern textile machinery, and throughout every effort has been directed to economy and efficiency in working by the reduction of transmission losses to a minimum.

A total of 102 h.p. is employed, split into four groups and controlled from a totally-enclosed industrial type switchboard (by Mr. George Ellison, of Birmingham), which is provided with one 200-A, 3-phase, 50-cycle, 415-V incoming panel, and four outgoing panels (75, 25, 25, and 25 A respectively), controlling the blowing machinery, spinning machinery, the winding machines, and the looms. Conduit in the granolithic flooring carries the power wiring from the main switchboard to distribution boxes flush with the floor. These boxes were specially designed by the English Electric Co. for weaving sheds, and each contains 12 "Zed" fuses.

The simplicity of the totally-enclosed squirrel-cage motor has led to its widely increased use in recent years, and it is in great evidence in this exhibit. Each combination in the bale-breaking, opening and scutching machinery exhibited by Messrs. Platt Bros. & Co., Ltd., is belt-driven by a Mather & Platt motor of this type controlled by an oil-immersed star-delta switch with three overload releases and a no-voltage release, by Mr. George Ellison. Various types of gins are individually belt-driven by Mather & Platt motors. The carding and combing machinery by Messrs. Wm. Tatham, Ltd., is driven by a similar motor, the waste carding engine being belt-driven from overhead, and the Nasmith comber, by John Hetherington, Ltd., being controlled by an oil-immersed star-delta starter by Messrs. Erskine, Heap & Co., Ltd. Drawing, slubbing,

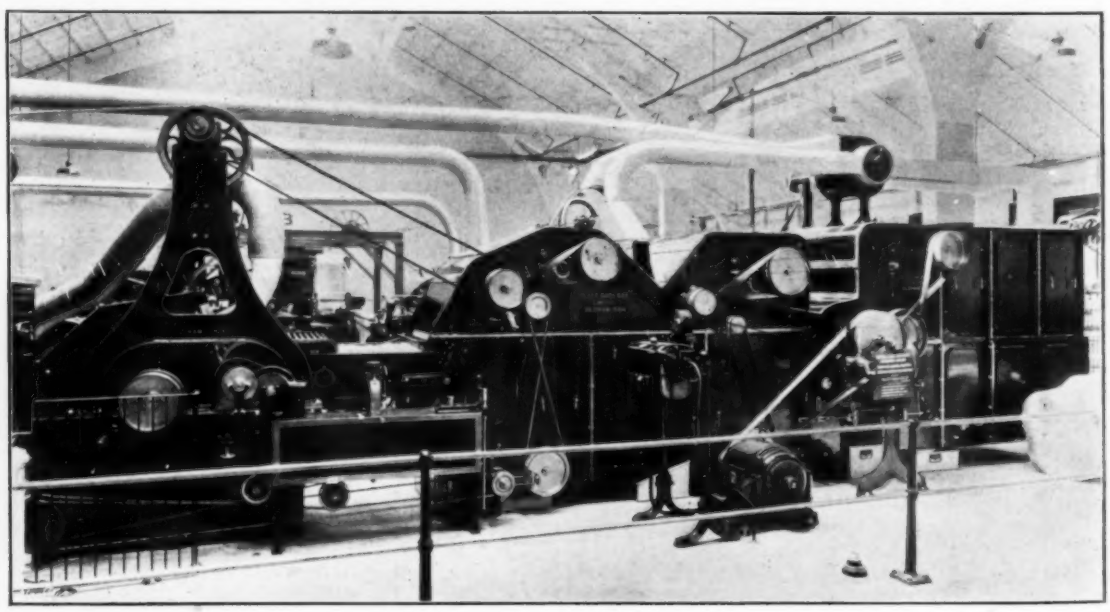

Fig. 2.—View of Opening Machinery.

and roving frames are also individually driven by Mather & Platt totally-enclosed squirrel-cage motors, transmission being effected through totally-enclosed laminated gears, the utilisation of centrifugal clutches of the "Broadbent" type enabling the motors to be switched direct on to the main. High efficiency with silent running and prevention of backlash have made transmission gearing manufactured by Laminated Gears, Ltd., of Sheffield, very popular in the textile trades, and interesting examples are shown. A Lancashire Dynamo & Motor Company's totally-enclosed squirrel-cage motor of 3½ h.p. is employed to drive the intermediate frame, being coupled direct to the drum shaft through a "Broadbent" centrifugal coupling, and controlled by an Erskine, Heap starter. The ring spinning frame is similarly driven.

Though modern textile practice is to drive mules in groups of at least four, each mule in the cotton exhibit is driven individually. A Mather & Platt motor, developing 10 b.h.p. at 955 r.p.m., with an Erskine, Heap star-delta starter, drives the self-acting cotton mule exhibited by Messrs. Asa Lees & Co., Ltd., and a waste mule by the same firm is driven in a similar way, the countershaft fast and loose pulley speed of the former being 540 r.p.m. and of the latter 400 r.p.m. A ring doubling frame exhibited by Messrs. Brooks & Doxey is driven by a Lancashire Dynamo & Motor Company's totally-enclosed squirrel-cage motor through reduction gearing, a "Broadbent" centrifugal clutch being incorporated. The exhibit of winders provides examples of Hans Renold chain drives, spur reduction gear drives, and belt drives. Each type is driven by a totally-enclosed squirrel-cage motor by Electromotors, Ltd., switched direct on to the mains. Fractional horsepower motors are used to drive various yarn testing and other instruments shown in connection with the spinning machinery.

The application of the individual drive system to looms has perhaps presented the electrical engineer with most of his problems in this sphere. The loom exhibit is a particularly comprehensive one, 12 firms showing 14 looms of various types and one cloth plaiting machine. The English Electric Co., Ltd., has provided seven individual motor equipments, and the Metropolitan-Vickers Electrical Co., Ltd., eight; several of these, with the various types of drive employed, are shown in our illustrations.

The Overpick woollen looms are fitted with the Renold chain drive and safety slipping device—a combination claimed to give all the advantages of belts with the positiveness of spur gears and to be more efficient than either form of drive. A cast-iron boss, bored and keywayed to suit the machine shaft, and operating from the sprocket by adjustable spring pressure forms the safety slipping device; the sprocket and pinion are of cast iron, having machine-cut teeth to suit the loom and motor speeds.

Examples are shown of motor and gearing mounted on a bracket incorporated in the loom frame, and of totally enclosed starters mounted on the loom itself and operated by the striking mechanism of the loom. In the case of the cloth plaiting machine, the design necessitated the incorporation of the motor in the machine itself and a totally-enclosed squirrel-cage motor of 0.9 h.p. having special feet, was supplied by the English Electric Co. for the purpose, the drive being by belt with the switch mounted on the frame work of the plaiting machine in a convenient position for hand operation.

Twenty-five 3-kW "Electro-Vapour" radiators, by Messrs. Benham & Sons, Ltd., London, are used to heat the building, which is wired for the addition of 12 more radiators should additional heating be deemed necessary in the autumn months. A complete sprinkler installation has been supplied by Messrs. Mather & Platt, who, in addition to the fireproof doors, have supplied the majority of the motors.

Two views of the exhibit are reproduced on page 220. The first is a general view of the looms, and fig. 2 illustrates the opening machinery.

Lighting and Power Notes.

(*Continued from page 216.*)

Campbeltown.—PROPOSED ELECTRICITY SUPPLY.—A special committee of the Town Council has been appointed to consider the question of introducing an electricity scheme.

Chesterfield.—YEAR'S WORKING.—The accounts of the Corporation electricity undertaking (engineer: Mr. R. H. Campion) for the year ended March 31st last, show a total revenue of £41,177, as compared with £37,455 in 1922-23. Working expenses totalled £20,123, leaving a gross surplus of £21,053, to which was added a sum of £397, being bank interest, &c., making a total of £21,450. Capital charges absorbed £16,466, and there was a net profit of £4,984, as against a surplus of £2,545 in the previous year. The sales of electrical energy amounted to 5,601,315 kWh, representing a record output and an increase of 48 per cent. on that of the previous year. The maximum supply demanded rose from 2,800 to 3,402 kW.

Dutch East Indies.—WATER-POWER DEVELOPMENT.—Work is well in hand on the establishment of a plant to utilise the water power of the River Mamasa in the central west portion of Celebes, one of the Dutch East Indies group of islands. The power station is being established on the banks of the Todokan River, about five miles from its outlet into the sea. It is estimated that for ten months of the year 180,000 h.p. can be delivered, the minimum during the remaining two months being 120,000 h.p. For the present, however, plant to the extent of only 100,000 h.p. will be installed. The work is being carried out by the N. V. Stickstoff Syndicate, which will utilise the energy in works for the production of nitric manures at Polewati on the coast.

Denny (Stirlingshire).—ELECTRICITY SUPPLY.—An agreement has been come to between the Town Council and the Scottish Central Electric Power Co., providing for a supply of electricity to the town for a period of 15 years.

Godalming.—STREET LIGHTING.—The Town Council has renewed its contracts with the Urban Electric Supply Co. for street lighting for another year at £950.

Gravesend.—YEAR'S WORKING.—The accounts of the Corporation electricity undertaking (engineer: Mr. C. F. McInnes) for the year ended March 31st last record a total income of £77,769, as compared with £61,865 in 1922-23. Working expenses amounted to £50,239, as against £40,043, leaving a gross surplus of £27,530 (£21,822). After deducting capital charges there was a net profit of £91,865, as compared with a surplus of £6,047 in the previous year. The sales of energy amounted to 14,067,123 kWh, an increase of 3,496,514 kWh, and the maximum supply demanded rose from 2,760 to 3,125 kW.

Grimsby.—YEAR'S WORKING.—We have received from the borough electrical engineer, Lt.-Col. W. A. Vignoles, a copy of the report on the working of the electricity undertaking for the year ended March 31st last. The total income amounted to £78,411, as compared with £81,311 in the previous year. Working expenses totalled £46,846, as against £47,909, leaving a gross profit of £31,564 (£33,408). After deducting capital charges there was a net surplus of £8,035, as compared with £9,779 in 1922-23. The capital expenditure, which included £7,850 for sub-stations and £6,296 for mains and services, amounted to £27,717. The electrical energy sold increased from 7,346,760 to 8,631,150 kWh, and the average price obtained decreased from 2.52d. to 2.08d. per kWh. The maximum supply demanded rose from 3,330 to 3,834 kW. A new turbo-alternator is in course of erection, and it is anticipated that it will be completed during the present month.

Irish Free State.—SPECIAL ORDERS.—In the Free State Senate last week the Special Order under the Electricity Supply Acts in respect of the urban district of Thurles (Co. Tipperary) was approved by the Senate. Approval was also given in the case of the Special Order of the Ministry of Industry and Commerce in respect of the urban districts of Blackrock (Co. Dublin) and Wicklow.

EDENDERRY (KING'S COUNTY).—The Rural District Council has approved an electric lighting scheme for the town.

DUBLIN.—The strike of the municipal employés, which involved the Corporation's power station workers, came to an end on Monday last, the authorities having agreed to postpone the proposed reduction of wages until next March.

Knighton.—STREET LIGHTING.—The Urban District Council has accepted the tender of the Knighton Electric Light Co. for public lighting for the coming winter.

Liverpool.—ELECTRICITY AND TRAMWAY ADMINISTRATION.—It has been suggested that the Tramways, Electric Power, and Lighting Committees should be divided into two sections:—(1) Tramways business under the control of the manager of the Tramways Department; (2) electric power and lighting and street lighting at present under the control of the city engineer. It has been suggested that the City Council should consider the proposal and discuss the desirability of forming two standing committees to carry out the duties of the present committee.

PROPOSED "ALL-ELECTRIC" HOUSES.—The Housing Committee has approved tenders for 1,000 houses in the Walton and Clubmoor districts to cost £600,000, and 121 flat residences to cost £100,000. It is proposed to wire the houses throughout and to install electric fires, water heaters, washers, ironers, &c.

London.—FULHAM.—The accounts of the electricity undertaking for the year ended March 31st record a net profit of £21,226, to which was added a balance of £17,939, making a total surplus of £39,165. Of this amount, £5,000 was transferred to reserve, £5,000 contributed to rate relief, and the balance of £29,165 was carried forward.

ST. PANCRAS.—The Electricity and Public Lighting Committee has recommended to the Borough Council that, subject to the consent of the Electricity Commissioners, sanction be given to the expenditure of £500 for the purchase of domestic appliances.

ST. MARYLEBONE.—The Electric Supply Committee has recommended that a ten-year agreement be entered into with the London & North-Eastern Railway Co. for the supply of electricity to the company's premises in the borough.

STEPNEY.—As recorded in our last issue the profit on the borough electricity undertaking for the year ended March 31st last was £38,736. Of this amount £28,000 has been contributed on the borough fund for the relief of the rates.

EAST HAM.—*Year's Working.*—The accounts of the borough electricity undertaking (engineer: Mr. W. C. Ullmann) for the year ended March 31st last record a total revenue of £81,527, a slight increase as compared with that of the previous year (£79,210). Working expenses amounted to £53,509, as against £50,486, leaving a gross profit of £28,018 (£28,724). To this was added a balance of £13,131, making a total of £41,149. After the payment of loan interest, sinking fund instalment, &c., there was a net profit of £17,101, as compared with a surplus of £20,547 in 1922-23. Of this amount £7,918 was contributed to the borough fund, £8,500 expended on mains, &c., and the remaining sum of £683 was transferred to the depreciation and renewals fund. During the year £14,829 was spent on capital account. The sales of electrical energy increased from 5,385,224 to 5,966,439 kWh, and the average price obtained fell from 3.44d. to 3.19d. per kWh. The maximum supply demanded rose from 2,904 to 3,125 kW.

METROPOLITAN ASYLUMS BOARD.—The Tuberculosis Committee recommends the acceptance of the offer of the Brentwood District Electric Co., Ltd., to supply electricity to the High Wood Hospital for Children, and the execution of an electric lighting installation at an estimated cost of £2,500.

Meriden.—ELECTRICITY SUPPLY.—The Rural District Council has passed a resolution to the effect that it is not prepared to undertake the distribution and sale of electricity by buying in bulk, but would be prepared to support an application authorising the Coventry Corporation to supply electricity.

Plymouth.—NEW PLANT.—At a recent meeting of the Corporation, sanction was given to an extension of the boiler-house plant involving an expenditure of £43,640.

Preston.—STREET LIGHTING.—The borough electrical engineer, Mr. J. F. Simpson, has submitted a report on street lighting to the Corporation. He states that new types of lanterns with specially designed prismatic reflectors have recently been introduced, and it is now possible to obtain even illumination of the street surface. His scheme provides for the replacement of the existing 90 high-pressure gas lamps by an equal number of electric lamps fitted with prismatic lanterns of the new type.

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

CHICHESTER.—Lighting: From 7d. to 6d. per kWh. Heating: From 4d. to 3d. Power: First 100 kWh per quarter, 4d. per kWh; next 100 kWh, 3d.; beyond, 2½d. per kWh.

SOUTH SHIELDS.—Lighting: Flat rate from 5d. to 4½d. per kWh. Power and heating: From 1½d. to 1¼d. per kWh. Traction: From 1½d. to 1¼d. per kWh.

Straits Settlements.—PENANG.—The report of the engineer-in-chief (Mr. W. J. Williams, M.I.E.E., M.A.I.E.E.) on the working of the municipal electricity undertaking of George Town for the year 1923 has come to hand. The total income amounted to $714,291.48 ($1=2s. 4d.), as compared with $631,231.16 in 1922. Working expenses amounted to $478,068.32, leaving a gross surplus of $236,223.16. To this was added $19,434.38, being interest, &c., making a total of $255,657.54. This was distributed as follows:—Interest, $116,551.08; sinking fund, $44,261.16; depreciation, $84,845.30; borough fund, $10,000. The capital expenditure during the year amounted to $1,138,099.40, the chief items being $412,294.73 for buildings, &c., $292,446.01 for machinery, and $369,302.86 for mains and services. The total now expended on the undertaking amounts to $2,987,981.33. The sales of electrical energy increased from 2,797,729 to 4,201,998 kWh.

Wolverhampton.—YEAR'S WORKING.—The report of the borough electrical engineer (Mr. S. T. Allen) on the working of the electricity undertaking for the year ended March 31st last records a total income of £179,263, as compared with £176,100 in 1922-23. Working expenses amounted to £95,290, as against £87,719, leaving a gross surplus of £83,973 (£88,381). To this was added a balance of £10,000 from the previous year and interest charged under hire-purchase agreements amounting to £11, making a total of £93,984. This was distributed as follows:—Interest on capital, £27,227; bank interest, £194; redemption and sinking fund, £24,505; income tax, £6,500; rate relief, £10,000; reserve, £15,557; balance carried forward, £10,000. The previous year's working resulted in a net surplus of £24,042. During the year £67,339 was spent on capital account, the chief items being £34,064 for machinery and £17,139 for mains and services. The electrical energy sold amounted to 33,262,667 kWh, an increase of 23½ per cent., and the average price obtained decreased from 1.513d. to 1.251d. per kWh. Two reductions in the charges for electricity were made during the year.

Tramway and Railway Notes.

Chesterfield.—YEAR'S WORKING.—The report on the working of the tramways undertaking (general manager: Mr. R. H. Campion) for the year ended March 31st last records a total income of £29,321. Working expenses amounted to £20,135, leaving a gross surplus of £9,185, to which was added bank interest, making a total of £9,387. After deducting capital charges there was a net profit of £2,943. The number of passengers carried was 3,883,671, and the car miles run totalled 294,223.

Continental.—POLAND.—Large electric railway schemes are in course of realisation in Poland. An engineering company of Posen, styled the "Tri," is to carry out the construction of the following lines:—(1) Dombrowa to Czenstochau and Lask, and thence to Zgierz, Kutno, Plock, Sierpe, and Brodnica, thus linking the Dombrowa coal basin with Pomerell. (2) From the upper Silesian coalfield to Wielun and Kempen. (3) From the Dombrowa coalfield to Opocno and Warsaw, where a bridge over the Vistula will have to be erected. The capital for these lines will be partly subscribed by the French Société Générale d'Entreprise and partly by Polish companies. English financial help is also anticipated.

London.—L.C.C. TRAMWAYS FINANCE.—In a statement made at the meeting of the London County Council on July 29th, Mr. C. W. Matthews, chairman of the Highways Committee, said that the total expenditure upon the Council's tramways amounted to £16,588,862, of which £2,809,905 represented sums paid to the companies when the systems were acquired. The total amount provided for repayment of the debt was £7,609,485, leaving £8,979,377 to be provided. The net amount received from the rates, after taking account of sums contributed to rate relief, was £373,058. The gross aggregate surplus on working had amounted to about £14,400,000.

EAST HAM.—*Year's Working.*—The report on the working of the borough tramway undertaking (manager: Mr. W. C. Ullmann) for the year ended March 31st last shows a total revenue of £78,316, a considerable decrease as compared with that of the previous year (£103,747), chiefly due to the revision of fares in January. Working expenses fell from £93,602 to £89,969, leaving a gross deficit of £11,653, as against a gross surplus of £10,145. A sum of £10,625 was transferred from the borough fund, and after deducting capital charges there was a net deficit of £35,673, as compared with a loss of £10,625 in 1922-23. The capital expenditure during the year amounted to £38,401, the chief item being £34,226 for permanent-way reconstruction. The number of passengers carried decreased from 18,165,512 to 15,342,953, and the number of car-miles run from 1,487,829 to 1,483,256.

AUTOMATIC SUB-STATION FOR NEW "UNDERGROUND" LINE.—The energy for the Hendon-Edgware extension of the "Underground" system which is to be opened for traffic on August 18th, will be supplied from an automatic sub-station at Burnt Oak. This will be the first of its kind to be used in this country for railway service.

Straits Settlements.—PENANG.—The accounts of the municipal tramway undertaking of George Town (engineer-in-chief: Mr. W. J. Williams) for the year 1923 show a total revenue of $287,917.32, as compared with $225,225.05 in the previous year. Working expenses totalled $211,637.87, as against $211,698.10, leaving a gross profit of $76,279.45 ($13,526.95). After deducting capital charges, there was a net surplus of $3,949.44, as compared with a deficit in 1922 of $34,876.64. The number of passengers carried increased from 4,818,396 to 5,590,838, and the car-miles run from 415,253 to 453,398. It was hoped that two railless cars would have been in operation during the latter part of the year, but the manufacturers failed to deliver them according to schedule. It was anticipated that they would be delivered early in 1924.

Telegraph and Telephone Notes.

India.—TELEPHONE SERVICE.—There were in existence in India on March 31st, 1923, according to a report of the Telegraph Department, 227 telephone exchanges, with 13,320 connections, owned and maintained by the Government, of which 140 exchanges with 1,468 connections were not operated by the department itself. In addition, there were 345 independent exchange systems with 1,157 telephones. Licensed companies owned 12 exchanges with 25,590 connections. The revenue of the systems in 1923 was 4,852,532 rupees, as compared with 4,169,004 rupees for the previous year. The increase can be attributed partly to the expansion of the system and partly to increased rates. The estimated value of the telephone system on March 31st, 1923, including trunks, was 19,100,000 rupees.—*Commerce Reports.*

Spain.—AUTOMATIC TELEPHONY.—The City Council of San Sebastian passed a decision in the latter part of May awarding the contract for an automatic telephone exchange to the L. M. Ericsson Co. The plant is designed for a total capacity of 20,000 lines, the initial capacity being 5,000. A number of smaller rural automatic exchanges will be connected to form so-called "satellite" exchanges. Therefore, they will be equipped only with line finders, connectors and their associated devices, each call to and from such an exchange being carried over the main exchange. This plant is of exceptional interest from a technical point of view. San Sebastian has a population of about 60,000, and is regarded as the second capital of Spain.—*Swedish Export.*

TELEPHONE RRORGANISATION. — An agreement has been arrived at between a large American telephone corporation and several of the most important banks in Spain by which the former is to take over the telephone system of Spain with a view to bringing it up to date.

The agreement provides for the formation of a corporation for the purpose, and includes the installation of an automatic telephone service, similar to that which has been installed in Havana, Cuba. The capital is to be raised by an issue of obligations financed by Spanish capital, while the technical staff and apparatus is to be purely American.

It is further understood that a controlling interest in the existing telephone company of Madrid has been acquired by the new corporation through the purchase of stock on the Bourse, and that negotiations are already well under way for obtaining a similar interest in the Barcelona telephone company.—*Financial Times.*

Switzerland.—AUTOMATIC TELEPHONY.—A commission of the National Council has recommended the acceptance, without modification, of the Federal Council's proposal to install at the Berne post office an automatic telephone exchange.

Radio Notes.

Germany.—RELAY BROADCASTING.—The second and more powerful Berlin broadcasting station (wave length, 500 metres) which was recently brought into service, has hitherto been employed to transmit the daily programme in conjunction with the original station (wave length, 430 metres). This is, however, only a provisional arrangement until the new station has completed the necessary period of experiment. Unless some other use is found for it, station No. 1 will then become superfluous. The *Vossische Zeitung* urges, in a leading article, that station No. 1 should be converted for relaying the British programmes.—*The Times.*

Peru.—BROADCASTING.—A radio-telephone broadcasting service is to be inaugurated shortly by the Peruvian Broadcasting Co., which holds an exclusive concession from the Government and of which the Marconi Co. is a stockholder.

Rumania.—RADIO COMMISSION.—A Government commission is studying the question of the use of radio-telephony by the public. At present there is no broadcasting service in the country.

Contracts Open and Closed.

(The date given in parentheses at the end of the paragraph indicates the issue of the ELECTRICAL REVIEW *in which the "Official Notice" appeared in our advertisement pages.)*

Open.

Argentina.—BUENOS AIRES.—October 16th. Argentine National Sanitation Works Department. Hydro-electric plant for Mendoza, including turbines, 3-phase a.c. generators, switchboard, &c.*

Australia.—MELBOURNE.—August 27th. Victorian Railways. 7-ton electric travelling crane, 3-motor type, complete with electric lifting magnets and equipment.

September 9th. Postmaster-General's Department. Switchboard cords.*

October 20th. Agent-General for Victoria. Morwell power scheme. Specification No. 24/68, 22,000-V insulators. (See this issue.)

Ayr.—Electric lighting installation at Stewarton Hospital. Burgh surveyor.

Belfast.—August 18th. Electricity Department. Motor generator and transformers. (July 25th.)

Belgium.—November 5th. The Post and Telegraph authorities at La Salle Madeleine, Brussels, are inviting tenders for the supply and installation of two automatic telephone exchanges at the Central Telephone Exchange in the Rue de la Paille, Brussels. Particulars (Cahier des Charges Special No. 3-39) for 7½ fr.

MONS.—August 27th. Provincial Government authorities. Supply and installation of a number of electric motors at the water-pumping station at Dour.

Birmingham.—August 30th. Salvage and Stables Committee. Plant for refuse disposal and salvage works. (For particulars see issue of July 25th.)

Burnley.—Town Council. Supply of oil engines and dynamos and other works in connection with proposed alterations and extensions at Altham sewage disposal works. Particulars from borough engineer and surveyor, Town Hall.

Crete.—October 25th. Municipality of Canea. The installation of lighting and power mains in connection with the projected electricity scheme, and the establishment of a system of railless electric cars in the town. Particulars for 250 drachmae.

Dublin.—August 9th. Electricity Department. Transformers and single-phase, three-phase, and slot meters for 12 months. (July 25th.)

August 19th. City Council. Two electrically-driven air compressors, &c. Specification from the City Treasurer, Exchange Buildings, Lord Edward Street, Dublin.

August 27th. Port and Docks Board. Two 2-ton electric wharf cranes. Mr. Joseph Mallagh, engineer to the Board, East Wall, Dublin.

Edinburgh.—September 1st. Electricity Supply. One 10,000-kW turbo-alternator with surface condenser and duplicate set of air and water-extracting pumps. (See this issue.)

Glasgow.—August 12th. Town Council. Electric lighting and heating installations at Woodside Halls. Schedules from the Office of Public Works, City Chambers.

India.—INDIA STORE DEPARTMENT, LONDON.—August 15th. Turbo-alternator and condensing plant for power house; boiler, economiser, pipework, &c., for power house; and 175-kW, 6,600-V, three-phase Diesel alternator sets, with water-cooling plant and pipework.

August 22nd. 75-kW and 38-kW crude-oil engine dynamo sets, with static balancers, and water-cooling plant.—*Reuter's Trade Service.*

Lochaber Hydro-Electric Scheme.—The North British Aluminium Co. has placed Contract No. 1, for the construction of a reinforced-concrete pier in Loch Linnhe, near Fort William, with approach viaduct, &c., with Messrs. Balfour, Beattie & Co., Ltd.

Looe.—August 16th. Urban District Council. Supply of electricity in the district. (July 25th.)

Manchester.—August 12th. Tramways Committee. Permanent-way special track work. Mr. Henry Mattinson, general manager and chief engineer, Corporation Tramways, 55, Piccadilly, Manchester.

August 28th. Electricity Committee. Electrically-driven air compressor plant and pipework, pipework for high and low pressure drains, and five 125-kVA, two 250-kVA, and three 500-kVA transformers. (See this issue.)

Morley.—August 25th. Town Council. Electrician's work required in erection of 48 houses, Middleton Road site. Plans, specifications, may be seen at Borough Engineer's Office, Town Hall.

Newcastle-on-Tyne.—August 15th. Tyne Improvement Commission. 10-ton overhead electric travelling crane. Specification from Messrs. Cackett & Burns Dick, Pilgrim House, Pilgrim Street.

Newport (Mon.).—August 25th. Corporation Electricity Department. 10,000-kW turbine, &c.; 10,000-kW turbo-alternator, &c.; and surface condensing plant, &c. (August 1st.)

New Zealand.—WELLINGTON.—September 23rd. Public Works Department. Waikato electric power scheme. Section 52, spillway regulating gates.*

October 28th. Switchgear, including 6,600-V oil switches, for the Lake Coleridge Power Scheme.*

CHRISTCHURCH.—October 21st. City Council. Electrically-driven pumping plants. (Ref. A X 1,220.)*

Port Talbot.—September 3rd. Borough Council. Electricity generating plant, underground mains, transformers, and meters. (See this issue.)

Salford.—August 23rd. Electricity Department. Coal supplies for 4 or 6 months from September 1st, 1924. Particulars from Borough Electrical Engineer, Frederick Road, Salford.

Southampton.—August 26th. Electricity Works. Two water-tube boilers, complete with superheaters, chain-grate stokers, economisers, mountings, induced-draught fans, steel chimney, steam, feed-water, and other piping, &c. (July 25th.)

South Africa.—JOHANNESBURG.—August 23rd. Municipal Council. 42 current transformers.*

September 10th. H.p. cubicles.

September 26th. Rand Water Board. Two centrifugal pumps and motors. (Contract No. 258).*

Stalybridge.—August 25th. Stalybridge, Hyde, Mossley, and Dukinfield Tramways and Electricity Board. Structural steelwork required in erection of new Hartshead power station. Specifications, &c., from Messrs. W. H. George & Son, architects, 7, Warrington Street, Ashton-under-Lyne.

Uruguay.—MONTEVIDEO.—September 10th. State Electricity Department. Insulators, &c.*

September 15th. 37,750 iron supports for aerial wires.*

September 23rd. 60,000 metallic and carbon filament lamps.*

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Closed.

Australia.—MELBOURNE.—City Council. Accepted:—

15,200 yd. of 3-in. fibre conduit (£1,773).—Western Electric Co. (Australia), Ltd.
Bare h.d. copper cables (£2,154).—British Insulated & Helsby Cables, Ltd.
Insulated copper cables (£9,774).—Enfield Cable Works (Australia), Ltd.
V.i.r. and triple-braided cables (£624).—Noyes Bros. (Melbourne) Pty., Ltd.
—*Tenders.*

Belmont (Co. Durham).—Parish Council. Accepted:—

Installing electric street lighting (£1,701).—Reid, Ferens & Co., Newcastle-on-Tyne.

Halifax.—Tramways and Electricity Committee.

In connection with foundations for 10,000-kW turbo-alternator at electricity works.—E. & T. Bower (£2,613). J. Berry (£140).

Education Committee. Electric lighting installation at the following schools:—

Akroyd Place (£343).—F. S. Jackson.
Parkinson Lane (£351).—G. Harrison.
Moorside (£178).—R. Spencer & Co.
Siddal (£176).—Electric Repair and Supply Co.

Italian-South American Cable. — Messrs. SIEMENS BROTHERS & CO., LTD., of Woolwich, have secured contracts for the manufacture and laying of about 3,200 miles of submarine telegraph cable to connect the Cape Verde Islands with Rio de Janeiro, touching at the island of Fernando Noronha off the northern coast of Brazil. The first section is to be completed by the end of January, 1925, and the whole scheme should be in working order by the end of May, 1925.

Liverpool.—City Council. Accepted:—

Construction of cooling towers, ponds, &c., at the Lister Drive power station (£32,147).—Joshua Henshaw & Sons.
Provision of ash-handling plant at the same station (£6,887).—J. Jenkins and Co.

London.—METROPOLITAN ASYLUMS BOARD.—Works Committee. Recommended:—

Installation of electric light and power mains, switchgear, &c., at the Head Office (£325).—T. Clarke & Co., Ltd.
Internal telephone system in the Accountant's Department, Head Office (£220).—W. H. Agar.
Internal telephone system in the Engineer-in-Chief's Department, Sheffield House (£170).—T. Clarke & Co., Ltd.

Stafford.—Electricity Committee. Accepted:—

One 200-kVA transformer (£231).—English Electric Co., Ltd.

Tonbridge.—Rural Council. Accepted:—

New battery for the electric lighting plant (£120), and £25 per annum for maintenance.—Gilbert & Stamper.

York.—City Council. Accepted:—

6,000-kW turbo-generator and condensing plant (£18,671).—Oerlikon Co.
The lowest English tender was £26,824.
Alderman Shipley, chairman of the Electricity Committee, in moving the resolution of acceptance, said the Committee would have liked to have given the order to an English firm, but considered they would not have been doing their duty to the ratepayers when the difference of cost was so great.—*Hull Daily Mail.*

Notes.

Educating the French Public.—The French Union des Syndicats d'Electricité has recently issued a non-technical booklet for the education of the public in electrical matters. It is intended for free distribution and is entitled "Guide du Consommateur de l'Energie Electrique à la Ville et à la Compagne."

Magnetic Properties of Ternary Alloys FE-SI-C.—The variations in the magnetic properties of iron and iron-alloys, even of supposedly constant composition, have been puzzling to the users. Mr. T. D. Yensen started to investigate this problem over ten years ago at the University of Illinois, and has continued it at the Westinghouse Research Laboratory since 1916, concentrating on iron and iron-silicon alloys. While the results obtained do not eliminate all the difficulties, they go a long way in that direction. A paper in the June issue of the A.I.E.E. *Journal* shows that carbon is largely responsible for the variations, because of the fact that amounts less than 0.01 per cent. remain dissolved in the iron in the solid state, even after slow cooling, and have a tremendous influence on the magnetic properties. Of much less effect is carbon precipitated as pearlite, free cementite and graphite, the effect being in the order named. If the effect of dissolved carbon be represented by 100, the effect of carbon as pearlite is 16.5, of carbon as Fe_3C 2.25, and of carbon as graphite nearly nil. The form assumed by carbon—aside from the carbon in solution—depends largely on the silicon content, and besides carbon, the grain size has a large and definite influence on the magnetic properties, due to the accompanying inter-crystalline amorphous cement that may be regarded as an impurity similar to other inter-crystalline impurities. The detrimental effect of sulphur, phosphorus and manganese on pure iron is in the order named, while phosphorus has a beneficial effect on high silicon alloys. The evidence obtained is to the effect that the increased reluctivity, coercive force, or hysteresis loss, due to carbon and other impurities that are precipitated combined with iron—including in this class the inter-crystalline cement—is caused by the inherent corresponding property of these precipitated impurities. Regarding the tremendous effect of carbon in solution, it is suggested that this is due to the entering of carbon into the more or less stable equilibrium arrangement of the ferro-magnetic structure, upsetting this equilibrium arrangement.

The Inertaire Transformer.—A new transformer, which is claimed to eliminate danger from explosions in power houses has been developed by the Westinghouse Electric and Manufacturing Co. It is known as the "Inertaire" transformer, was developed by Mr. W. M. Dann and Dr. D. R. Kellogg, and has a cushion of nitrogen above the oil surface in place of the air that usually occupies that space. The body of nitrogen is automatically created and maintained by the natural "breathing" of the transformer oil, thus securing the benefits that are derived from contact with the oil of an inert and protective gas having no oxygen content. The results obtained by the new type of transformer are said to be as follows: Oxidation of the oil is prevented; moisture is excluded from the oil; risk of fire or explosion of inflammable gas above the oil surface is eliminated; and the cushion of compressible gas above the oil surface is effective in case of a sudden increase of pressure due to an internal breakdown of the transformer.

Oil is used in a transformer as an insulator, and to smother any arcs that may occur between windings. The air being drawn into the transformer due to the "breathing" action is made to pass through deoxygenating and dehydrating chemicals. The nitrogen blanket, since it prevents air from reaching the transformer oil, likewise prevents it from mixing with oxygen and so "sludging." It is always possible that some fault under the oil level may result in an explosion of liberated gases. These explosions are not so violent as those which may occur above the oil level, but to prevent them the "Inertaire" transformer has a relief device, which rests upon the manhole opening in the top of the transformer case. It consists of a circular diaphragm of thin sheet micarta clamped to a support placed directly beneath the manhole cover. The latter itself rests upon the gasketed surface of the diaphragm support, and is free to move upwardly except for its weight and the retarding action of a number of heavy springs. The diaphragm is clamped in position with a ring and a gasket, forming under normal conditions a seal which is gas- and oil-tight. Thus, if an explosion occurred, the pressure would first rupture the diaphragm and then force the manhole cover open far enough to permit the gases to escape. Then the springs quickly bring the cover back to its original position, in which it closes the opening. The operation does not permit the discharge of oil or the diffusion of air into the transformer case. Perhaps the most interesting test made was the exploding of as many as twelve 40-gram bombs at a time in the transformer.

The Ljungström Turbo-Condensing Locomotive. — A *Reuter* dispatch from Stockholm states that M. Ljungström's turbo-condensing locomotive has made a record journey, travelling the whole distance between Gothenburg and Stockholm (458 kilometres) without renewing its coal supply, and consuming only two cubic metres of water, while ordinary locomotives consume 45 on the same journey. The saving of fuel is reckoned at about 50 per cent., compared with the consumption of ordinary engines. The locomotive as originally introduced was rather easily put out of order, but constant improvements have been, and are still being, made. The dispatch adds:—"The locomotive is particularly suitable for poorly-watered countries. The Swedish State Railways have ordered one engine; further orders are uncertain at present, as they will depend on the experience gained during the electrification of the Gothenburg-Stockholm line which has already commenced."

Educational.—Reporting to the Durham County Education Committee recently, the Director of Education (Mr. A. J. Dawson) stated that a scheme for effectively teaching electrical engineering was very desirable in the Jarrow district of Tyneside. The number of students in electrotechnics last session taking the second-year course was 20, taking the third-year course 17, and attending classes in Newcastle and Sunderland 17, making a total of 54. These figures, however, did not afford conclusive evidence of the real needs of the district, because the establishment of a properly-equipped centre would in all probability quicken the demand for instruction and lead to a considerable increase in the number of students. A subcommittee was appointed to consider a scheme for erecting a building at Jarrow for the purpose of carrying on classes in electrical engineering.

ROYAL TECHNICAL COLLEGE, GLASGOW.—Departments of Engineering.—The session 1924-25 will commence on September 3rd. Calendar, 3s. post free, and prospectus (free), may be obtained on application to the Director. (See our advertisement pages to-day.)

UNIVERSITY OF LONDON, UNIVERSITY COLLEGE.—Faculty of Engineering.—The 1924-25 session commences on Monday, September 29th. A Goldsmid entrance scholarship, tenable in the Faculty of Engineering, value £120, will be competed for in September next. Application must be made not later than September 8th. Particulars of courses, &c., can be obtained on application to the secretary, Mr. W. W. Seton, University College, London, W.C.1. (See our advertisement pages to-day.)

Appointments Vacant.—Clerk of Works and Electrician in Charge, for the Dearne District electricity supply scheme (£5); Shift Engineer, for the Newton Abbot power station of the Borough of Torquay (6,000 kW); Plumber-Jointer for the Stepney Corporation Electricity Department. (See our advertisement pages to-day.)

Sydney Electrical Contracts.—In consequence of the allegations regarding improper collusion of firms in the submitting of tenders for electrical and other work, the Sydney City Council has asked for the appointment of a Royal Commission to investigate the matter.

Tasmanian Progress.—In the course of his speech when opening the State Parliament at Hobart on July 29th, Sir H. Nicholls, the Administrator, mentioned the substantial progress made by the Non-Political Advisory Board for the development of Tasmania's latent resources, adding that forest plantation and flax-growing schemes had already been approved. The mining outlook, he said, was brighter. The growth of hydro-electric undertakings had exceeded anticipations, and extensions were in progress. There were good prospects of the establishment of two new industries shortly. The financial position was more satisfactory than had been anticipated.—*Reuter.*

Chinese Notes.—The Kwang Hwa Electric Co. of Lungenchow, Fukien Province, promoted by Cheng Fung Jen, member of the provincial assembly, has been approved by the Ministry of Communications. The company is required to start work within six months, and in due course to present to the Ministry for inspection a sketch of the machinery used, a copy of the proposed rules of management, and the date on which work is expected to begin.

Under the auspices of the Chihli Commercial Museum at Tientsin, an industrial exhibition to be known as Kao Kung Wei will be held from September 1st to October 10th. The object is to encourage Chinese manufactures.

The Peking Tramway Co. expected to begin regular traffic on July 1st this year. As the company's power station at Tungchow could not be completed by that time, power from the Peking Electric Light Co. was utilized temporarily. Only 25 cars are being used pending the completion of the Tungchow station.—*Chinese Economic Bulletin.*

Radio Propagation Phenomena.—Mr. F. Kiehitz, of the National Telegraph Engineering Bureau, Berlin, Germany, contributes a paper to the June issue of the *Proceedings* of the Institute of Radio Engineers on the subject of the propagation phenomena and disturbances of reception in radio telegraphy. The propagation of electromagnetic waves over the earth's surface is studied, particularly for very long-distance transmission, for which it is deduced that short waves are inherently unsuitable. Methods of quantitatively determining the strength of received signals are shown to be necessary; and some of the results obtained by their use in connection with diurnal and seasonal variations of transmission are given. The simultaneous appearance of disturbances of reception at widely separated points is investigated and found to exist, and it is concluded that the source of such widespread disturbances may be in iron-containing portions of the earth's crust subject to varying magnetic fields and with a stepwise altered magnetisation according to the Barkhausen effect.

Fusions in German Electrical Industry.—A Cologne report to the Department of Overseas Trade quotes the *Koelnische Zeitung* of July 24th to the effect that a number of German electrical concerns have jointly formed a new share company under the name of Elektrowerke A.G., Duesseldorf, with a capital of 100,000 gold marks. The concerns interested are:—Bergische Elektrizitaetsgesellschaft Gebr. Nolzen, of Ronsdorf; the Stopler Elektromotorenfabrik Heinz Ziegler, of Stolp (Pomerania); the Wilma Elektromotorenfabrik, of Merkendorf, near Auma i.Th.; the Widerstands-Baugesellschaft m.b.H., Bonn; the Gesellschaft fuer elektrische Industrie G.m.b.H., Cassel; and Karl Schlueter, elektrische Anlagen G.m.b.H., Dusseldorf. The intention is to amalgamate for the production and sale of the manufactures of all the concerns.

Westinghouse Interests in Russia.—The following communication issued by the Russian Trade Delegation has been published in the *Financial Times*:—"The Westinghouse Co., the majority of whose shareholders are Englishmen, was, as an exception, not nationalised by the Soviet Government, and has continued to operate to the present time by agreement with the Supreme Economic Council. The company, however, has practically no current capital, the shareholders having taken no steps to fill up vacancies on the Board of Administration, nor to renew the appointment of their manager, the engineer Goldmerstein, nor to supply means to the company to carry on its affairs. Consequently the company is being sued in the Soviet Courts for a number of claims against it. In the absence of anyone who can legally represent the company in the Courts, the Soviet Court has, in accordance with Soviet law, appointed a trustee to safeguard the interests of the company at the trial. The first sitting of the Court to hear one of the charges against the company was fixed for July 23rd, but on the request of the trade delegation the sitting has been postponed so as to enable the authorities to inform the English shareholders of the coming action against the company and to enable them to take steps to safeguard their interests at the trial should they desire to do so. In accordance with Soviet law, should the complaints against the company be substantiated, and should the sums owed by the company not be paid, the actual property of the company will have to be sold at public auction in order to cover the claims against the company."

Late Parliamentary.—THE LANARKSHIRE HYDRO-ELECTRIC BILL.—In the House of Commons, on August 5th, this Bill was given a third reading against a motion for its rejection.

Our Personal Column.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the* ELECTRICAL REVIEW *posted as to their movements.

Mr. C. H. WALKER is leaving Electrical Conduits, Ltd., after 11 years' service, in order to take up the post of sales manager for the Stella Conduits Co., Ltd., Bilston, on August 11th.

The salary of Mr. A. J. ABRAHAM, M.I.E.E., general manager of the Bexley Council Tramways and Dartford Light Railways and chief engineer to the Bexley Urban District Council electricity supply, has been increased by £50 per annum by the Joint Tramways Committee, and the Electricity Committee has granted him an honorarium of 100 guineas (50 guineas to be paid at once and 50 guineas on March 31st, 1925).

Mr. A. G. BLAKE, late of Messrs. A. Emanuel & Sons, Ltd., has joined Messrs. L. G. Hawkins & Co., Ltd., of London, as manager of their glass and "Ivanhoe" glassware department.

Mr. F. NICKLIN has been appointed mains engineer to the Nuneaton Corporation Electricity Department.

Mr. G. BASIL BARHAM, for many years connected with the Edison & Swan United Electric Light Co., Ltd., and a former editor of *The Engineering Times*, has been appointed editor of the *Contract Journal* in succession to the late Mr. W. M. Madden.

Messrs. THOMAS F. MACKIE and JOHN A. MCKEE have resigned their position as directors of the Hurst Electrical Plant, Ltd., of Belfast.

Mr. WILLIAM J. STANDING, for 21 years a member of the Ilford Urban Tramway staff, who has retired, has been presented by his colleagues with an illuminated address and a cheque.

Mr. JOHN HORNE, A.M.I.E.E., who was for many years with the Metropolitan-Vickers Electrical Export Co., Ltd., and the British Westinghouse Co., Export Department, London, and latterly with the Westinghouse Electric International Co., has now joined Messrs. Johnson & Phillips, Ltd., as export sales engineer. His headquarters are at 12, Union Court, Old Broad Street, E.C.2.

On July 30th, Mr. D. Ross, before leaving the Dundee Electricity Department to take up an appointment on the mains staff of the Ayrshire Electricity Board, was presented with a gold watch and chain by the mains staff and other employés at Dundee.

Mr. JAMES MCCRORIE, electrician, Newton Carpet Works, Ayr, was presented with a silver tea and coffee service by the employés on the occasion of his wedding.

The REV. CANON ERNEST WILLIAM BARNES, M.A., D.Sc., F.R.S., Canon of Westminster since 1918, has been appointed Bishop of Birmingham, in succession to Dr. Russell Wakefield, who has resigned, and thus becomes a bishop at the age of 50. He is a leader of advanced thought in the church and his views are well known to engineers. His striking sermon preached to the members attending the Cardiff meeting of the British Association four years ago is still the subject of discussion. The new bishop is a distinguished scientist; he was Second Wrangler and first Smith's Prizeman. At Cambridge he was President of the Union, and he was Master of the Temple from 1915 to 1919.

Obituary.—SIR GEORGE BEILBY, F.R.S.—We regret to record the death, which occurred suddenly at Hampstead on Friday last, of Sir George Beilby, LL.D., F.R.S., the distinguished industrial chemist, at the age of 73 years. Sir George had devoted a large part of his life to research and investigation of fuel economy and was influential in the setting up of the Fuel Research Board. He was appointed chairman of the Board and Director of Fuel Research and he designed and carried out the construction and operation of the Fuel Research Station at East Greenwich. He was a director of the Castner-Kellner Alkali Co., Ltd. He had been president of various scientific societies, he was an F.R.S., and was knighted eight years ago for his fuel research services.

Wills.—SIR L. W. LLEWELYN, of Newport, who was a director of many companies, including the South Wales Power Co. and the Treforest Electrical Consumers' Co., Ltd., left £205,187 gross personalty.

Mr. J. H. COOPER, director of Paignton Electric Light and Power Co., left £3,078 gross, with net personalty £2,031.

New Companies Registered.

Weaver Tidal Power Syndicate, Ltd. (199,616).—Registered as a "public" company on July 29th, with a nominal capital of £30,000 in 2s. shares. To carry on the business of electricians, generators and storers of electricity, &c. The first directors are:—L. W. Weaver, Ivy Bank, Seaview Avenue, West Mersea, contractor; H. J. Weaver, 37, Canterbury Road, Pinner, merchant. Minimum cash subscription 7 shares. Qualification (except first directors), 500 shares. Remuneration, £300 each per annum (chairman, £900). The registered office is at 64, Victoria Street, Westminster, S.W.

Auto Mechanical Rectifiers, Ltd. (199,589).—Private company. Registered July 29th. Capital, £2,000 in 20,000 ordinary shares of 1s. each and 1,000 preference shares of £1 each. To acquire from A. Barnett and exercise and vend a certain invention for charging batteries from alternating current. The first directors are:—I. Korn, 57, Bedford Street, E.1, costumier; A. Nathan, 37, Bancroft Road, E.1, agent; J. Streletski, 37, Bancroft Road, E.1, engineer; S. Cross, 15, Louisa Terrace, Stepney, E.1, merchant; A. Barnett 269, Mile End Road, E.1, electrical and mechanical engineer. Qualification, 1 share. Solicitor: E. M. Tringham, 53, Doughty Street, John Street, W.C.1. Registered office: 91, Tabernacle Street, E.C.2.

International Wireless Manufacturers, Ltd. (199,566).—Private company. Registered July 28th. Capital, £100 in £1 shares. To carry on the business of wireless telegraphy, telephone and general engineers, manufacturers of wireless sets and component parts, &c. The provisional directors are:—H. R. Simmons, 2, Arundel Road, West Croydon, engineer; E. A. Hopkins, 7, Southampton Street, W.C.1, advertising agent. Solicitors: H. Crafter & Co., 35, Bloomsbury Square, W.C.1.

Herrick Durell & Co., Ltd. (199,521).—Private company. Registered July 25th. Capital, £3,000 in 1 shares (2,900 10 per cent. cumulative preference and 100 ordinary). To adopt an agreement with R. Herrick, and to carry on the business of electricians, electrical engineers and manufacturers, suppliers of electricity, carriers of passengers and goods, manufacturers of and dealers in railway, tramway, electric, magnetic, galvanic and all apparatus and things used in connection with the generation, distribution, supply, accumulation and employment of electricity, &c. The first directors are:—R. Herrick, 5, Moss Hall Crescent, North Finchley, N.12, electrical engineer; S. L. Durell, 5, Oxford Villas, Wormley, Herts., electrical engineer. Solicitors: Merton, Jones and Lewsey, 11, Old Jewry Chambers, E.C.

Cox-Cavendish Electrical Co. (1924), Ltd. (199,482).—Private company. Registered July 24th. Capital, £6,000 in £1 shares. To carry on the business of manufacturers and sellers of all kinds of scientific, medical and surgical apparatus and accessories, including X-ray and high-frequency apparatus, light and heat apparatus, Finsen lamps, vibrators, pumps, static machines, nebulisers, transformers and batteries for cautery, light, galvanic, faradic and sinusoidal electricity and all purposes, &c. The permanent directors are:—E. R. G. Greville, "Lauriston," Field Crescent, Hendon, N.W.; E. E. Greville, 13, Fawley Road, Hampstead; F. W. Read, 12, Ulleswater Road, Southgate, N.14; E. H. Willis, 64, Lewisham Park, S.E.13. Qualification, £50 shares. Secretary (pro. tem.): G. Ogilvie Mitchell. Solicitors: Norman, Hart and Mitchell, 21, Panton Street, S.W.1. Registered office: 105, Great Portland Street, W.1.

Improved Arc Welding Co., Ltd. (199,632).—Private company. Registered July 30th. Capital, £100 in £1 shares. To carry on the business of arc and acetylene welders, founders, automobile, and mechanical engineers, manufacturers of agricultural implements and other machinery, &c. The permanent directors are:—P. F. Smith, 165, Croxted Road, West Dulwich, S.E.21, consulting engineer (chairman); Ethel M. Wookey, 41, Deronda Road, Herne Hill, S.E.24, secretary. Registered office: 64, Victoria Street, S.W.1.

Midget Lamp Co. (1924), Ltd. (199,639).—Private company. Registered July 30th. Capital, £1,000 in £1 shares. To carry on the business of manufacturers and exporters of incandescent electric lamp bulbs, electric lamp and bulb makers, glass blowers and annealers, manufacturers of electric filaments, scientific instrument makers, &c. The subscribers (each with one share) are:—C. P. S. Weedon, 85, London Wall, E.C.2, managing clerk; Nora B. White, 85, London Wall, E.C.2, typist. The subscribers are to appoint the first directors. Qualification, 50 shares. Remuneration, £25 per annum. Solicitors: Dehn & Lauderdale, 83, London Wall, E.C. Registered office: 38, St. Clement's Mansions, Fulham, S.W.

Womersley's Electric Co., Ltd. (199,578).—Private company. Registered July 28th. Capital, £1,000 in £1 shares. To carry on the business of mechanical, electrical, and wireless engineers, manufacturers of or dealers in goods used in a picture house, theatre, or kinema, dealers in material used in the manufacture of mechanical, electrical, and wireless apparatus, &c. The first directors are:—H. Womersley, Eynes Terrace, Armley, Leeds, engineer (permanent managing director); Mrs. E. Womersley, Eynes Terrace, Armley, Leeds. Registered office: Steep Causeway, Crab Lane, Armley, Leeds.

Official Returns of Electrical Companies.

A. Behm (London), Ltd.—Debenture dated July 16th, 1924, to secure £1,500, charged on the company's undertaking and property, present and future, including uncalled and unpaid capital (if any). Holder: W. Lovegrove, Hillmorton Lodge, Rugby Road, Worthing.

Johnson & Turner, Ltd.—Satisfaction in full on May 30th, 1924, of debentures dated June 28th, 1923, securing £300.

Wireless Equipment, Ltd.—H. H. Foster, of 806, Salisbury House, London Wall, E.C., was appointed receiver on July 22nd, under powers contained in debentures dated May 2nd, 1924.

Rangoon Electric Tramway and Supply Co., Ltd.—Satisfaction to the extent of £9,150 on May 28th, 1924, of debenture stock dated February 1st, 1906, December 22nd, 1908, November 5th, 1913, and January 25th, 1924, securing £250,000.

City Notes.

Marconi International Marine Communication Co., Ltd.

Senatore Marconi (chairman) presided at the annual meeting held on July 30th, and in presenting the report and accounts (*vide* ELECTRICAL REVIEW, July 25th, p. 152) said that the reserve for obsolescence (£45,915) had been completely applied to obsolescent plant; the 5½ per cent. first mortgage debentures had been slightly reduced. In the profit and loss account it was seen that the actual general charges were lower, but the loss incurred through the failure of the Banco di Sconto increased the item by £5,000. The expenses of ships' telegraph stations were £43,500 lower, due in part to lower remuneration to operators. The number of ships fitted with the company's system remained the same as in 1922, therefore the reduction in profit had not arisen as a consequence of reduced business, but from exceptional causes. The retention of long-service operators during a period of depression had resulted in a loss of £35,000. Efforts were being made to effect arrangements which would reduce this loss. The direction-finder business was satisfactorily extending, as was also the development of lifeboat sets and equipment for trawlers. The erection of long-distance broadcasting stations would stimulate the sale of receiving sets for use at sea. Another source of revenue was in prospect. This was a new patent apparatus which had emanated from the parent company, but regarding which he would say no more at the moment.

The report and accounts were adopted.

Kalgoorlie Electric Tramways, Ltd.

The annual meeting of this company was held on July 30th, under the chairmanship of Mr. A. H. P. Stoneham. In moving the adoption of the report and accounts, which were abstracted in our last issue (p. 191), the chairman said that the reduction in the traffic receipts (£2,292) was due to the closing of the mines owing to a dispute regarding hours. In addition, very severe weather was experienced during June, and only those forced to travel took advantage of the company's services. The reduction of the miners' wages reacted against the company, but developments were in hand which should increase the number of men employed at the mines with corresponding benefit to the company. It was quite certain that something would have to be done if Kalgoorlie was to remain a city of any importance; the population was decreasing, and houses were being pulled down. Although the local authorities were paid 3 per cent. of the gross receipts from the tramways, they had licensed a competitive motor-'bus system. The company's relations with its employés had been harmonious.

In conclusion, the chairman said that unless a rich and permanent find were made he did not see how the condition of Kalgoorlie could improve. There was a chance that the wool industry would be developed in the district. The revenue for the first four months of the current year was smaller, and so was the operating profit. The report and accounts were adopted.

Enfield Cable Works, Ltd.

The report of the directors for the year ended June 30th last states that the net revenue was £72,972 (including £18,966 received from the purchase and sale of the assets of the London Foundry Co.), as compared with £43,646 in 1922-23. After deducting directors' fees, interest, depreciation, and corporation profits tax, there is a profit of £60,139, as against £29,924. With £9,878 brought forward, a total of £70,017 is available. It is proposed to deal with this as follows:—Dividend of 12½ per cent. (as against 10 per cent.); writing off expenses of preference share issue, £13,815; to reserve, £5,151; leaving £14,892 to be carried forward. The meeting is to be held on August 15th.

Yorkshire Electric Power Co.

The directors report an increase in the amount of energy sold during the first six months of the current year, as compared with the first half of 1923. Interim dividends at the rate of 3 per cent. are declared on both the cumulative preference and ordinary shares, as in 1923. The report makes mention of the rejection of the company's Bill to give effect to an electricity scheme for the West Riding (Aire and Calder) District. Good progress has been made by the company in the economic development of supply in its area. Of 64 undertakings in operation, 54 are already associated with the company.

Electrical Distribution of Yorkshire, Ltd.

The directors report that increases again occurred during the first half of the present year in the number of consumers connected and the amount of energy sold. An interim dividend at the rate of 3½ per cent. (free of tax) has been declared for the half-year. The Burley-in-Wharfedale and District, the Gildersome and District, and the Guisely and Yeadon Special Orders have been confirmed by Parliament. The company now holds 28 orders in the West Riding. The South Yorkshire Electricity Special Order, applied for in 1921, has been made and approved by the Minister of Transport, and now awaits confirmation by Parliament.

West India and Panama Telegraph Co., Ltd.

The report of this company was dealt with in our issue of July 25th (p. 152). The annual meeting was held on July 30th, when Sir Alexander King, who presided, said that the hope that the Government would abandon its intention of laying competitive cables in the West Indies had proved fruitless. The scheme was not only injurious to the company, which had given a telegraph service in the West Indies for over 53 years, but it was a wasting of public money in the provision of an unnecessary service. He did not think that the excuse of an "All-Red Route" was a sufficient answer to this charge. As stated in the report, the company could not hope to continue operations after September 30th, when the Government subsidies ceased, except at a very heavy loss. The debenture holders would have the first claim on any assets, up to an amount of £89,600, and in his (the speaker's) opinion there could not be anything left for the shareholders. The report and accounts were passed.

Stock Exchange Notices.—Dealings in the following securities are to be specially allowed under Rule 159:—

Folkestone Electricity Supply Co.—50,000 ordinary shares of £1 each fully paid, Nos. 1 to 50,000, and 50,000 5 per cent. cumulative preference shares of £1 each fully paid, Nos. 1 to 50,000.

London Electric Supply Corporation.—50,000 6 per cent. preference shares of £5 each. £1 paid, Nos. 90,001 to 140,000.

Metropolitan Electric Supply Co.—119,395 4½ per cent. cumulative preference shares of £1 each, fully paid, Nos. 380,606 to 500,000.

Application has been made for the following to be quoted in the Official List:—

British Insulated and Helsby Cables.—£516,002 5 per cent. mortgage debenture stock.

Belgium.—The Société Belge pour la Fabrication des Cables et Fils Electriques, of Brussels, and Buysinghen-lez-Hal is increasing its capital to the extent of two million fr.

La Société Bruxelloise d'Electricité, of Brussels, is increasing its capital from seven million to 15 million fr.

Bristol Tramways and Carriage Co., Ltd.—The directors have declared an interim dividend on the ordinary shares for the half-year ended June 30th at the rate of 3 per cent. (less tax).

Charing Cross Electricity Supply Co., Ltd.—Interim dividend of 1s. 3d. per share on the ordinary shares of the West End undertakings for the half-year ended June 30th, 1924.

Westminster Electric Supply Corporation, Ltd.—An interim dividend of 5s. per share is recommended for the half-year to June 30th last. Last year's distribution was 4s. 6d. per share.

City of Buenos Ayres Tramway Co. (1904), Ltd.—A dividend of 1s. 3d. per share (5 per cent. per annum), less tax, has been declared for the quarter ended June 30th last.

Waste Heat and Gas Electrical Generating Stations, Ltd.—Interim dividend of 1½ per cent., less tax, for the half-year to July 31st.

Australia.—The English Electric Co. of Australia, Ltd., reports a profit of £37,500 for the year ending with March last. A dividend at the rate of 10 per cent. has been declared.

National Gas Engine Co., Ltd.—It has been decided to make no interim distribution on the ordinary shares.

Cork Electric Tramways and Lighting Co., Ltd.—Interim dividend on the ordinary shares of 3 per cent., less tax.

London Electric Supply Corporation, Ltd.—Interim dividend of 4 per cent., less tax, on the ordinary shares.

Stocks and Shares.

MONDAY EVENING.

HOLIDAY influences are very marked in the stock Exchange, as the patient follower of pure journalese would say. The merely personal view endorses the August platitude. Tennis, the punt on the river, the season ticket at the Oval—these make their appeal even on a Bank Holiday when a stocks and shares article stands waiting to be dealt with. People are not doing much in the Stock Exchange direction. Our price lists this week record but fifteen alterations out of the seven dozen prices quoted, and the changes possess no especial significance except that of a four-point recovery in Brazilian Tractions, due to the reported defeat of the rebels at Sao Paulo. Many people look for a rise to take place this month in the Bank Rate, and the event has been so well discussed in advance that, when it materialises, no particular change in prices is likely to occur.

We have usually looked back, at this season of the year, upon the variation in prices that has occurred during the preceding seven months. The present twelvemonth has brought heavy falls in Home Railway prices as a whole, but the Underground stocks escaped to some extent by reason of the Exhibition traffics. This is a comparison of half-a-dozen issues:—

RAILWAY STOCKS AND SHARES.

Stock or share.	December, 1923.	Now.	Rise or fall.
Central London Ord.	73	68½	−4½
Mesropolitan	72	81	+9
District	84½	80½	−4
Underground Ord.	2½	2½	−½
" "A"	8/-	7/6	−6d.
" Inc.	100	99	−1

The 'bus, tube and tram strikes evoked a grave warning from Lord Ashfield of the manner in which increased working costs would act upon the business of running the Underground profitably, and Districts have not recovered, as yet, from this. Metropolitan Consolidated has enjoyed just lately an increase in the dividend. Underground Incomes have been as low as 90 during the present year. The rally to 99 followed upon the declaration of the full 3 per cent. tax-free dividend, for the past six months.

Electricity supply companies are now increasing their interim dividends in several cases. The outlook is still charged with a good deal of uncertainty, and this has prevented prices from going ahead. In a comparative table, it is difficult to give the value of rights upon shares which participated in new issues, &c. Bearing this in mind, the catalogue makes a very interesting commentary upon the net result of the seven months' working. We take the London companies' ordinary shares:—

ELECTRICITY SUPPLY SHARES.

Ordinary.	December, 1923.	Now.	Rise or Fall.
Brompton	2½	2/-	−4/3
Charing Cross	14¾	41/3	−16/3
Chelsea	37/-	37/6	+6d.
City of London	2½	45/9	−1d.
County	40/-	49/6	+9/6
Kensington	10¾	9¾	−1
London	4½	31/-	−5/3
Metropolitan	35/9	1¼	−¼
St. James'	11¾	10¾	+1½
South London	1½	42/3	+4/6
Westminster	10⅛	10½	+⅜

The most striking movement is the rise of 9s. 6d. in County of London shares, for the company is playing a very prominent, if not the leading part in the negotiations which are afoot in connection with the industry's future. The rise of 30s. in St. James' and Pall Mall shares is also noteworthy. The declines in Charing Cross and in Kensingtons are due to the prices having been marked ex rights to new shares.

Anomaly stands out in the fact that the Eastern cable group has been dull, upon wireless developments, and yet Marconi shares themselves are 10s. lower. Globes and Westerns are better on balance. Eastern ordinary has fallen 2½ and Eastern Extensions are 12s. 6d. down. That other alterations are not very important, as this table shows:—

TELEGRAPHS, &C.

Stock or share.	December, 1923.	Now.	Rise or fall.
Anglo-American Pref.	103½	103	−½
Eastern Extension	16¾	16	−¾
Eastern Telegraph	184	181½	−2½
Globe Ord.	17	17½	+½
Great Northern	28	27¾	−¼
Indo-European	33½	32½	—
Marconi	2⅛	1⅞	−¼
United River Plate	6¾	6¼	−½
West India and Panama	1/-	1/-	—
Western Telegraph	15¾	16¼	+½

The West India and Panama Company is threatened with early extinction, as noticed here last week. A remarkable feature is the rise in Radio Corporation Common shares, with a very much greater recovery in Canadian Marconis, on the Government's announcement of its intention to use the companies' systems in its wireless enterprise.

Cable manufacturing shares have been rising steadily throughout this year. Electric industrials are disposed to be easier. The engineering descriptions show tolerable firmness, but the iron and steel list is dull. We give half a dozen examples:—

MANUFACTURING.

Share.	December, 1923.	Now.	Rise or fall.
Babcock	2¼	48/-	+2/-
British Aluminium	18/9	25/9	+7/-
Callenders	2¾	3¾	+1
General Electric	19/9	17/9	−2/-
Henleys	48/9	2/1½	+1
India Rubber	1¼	1¼	—

Colonial and foreign traction stocks are irregular. British Columbia Electrics have been good on the increase in dividends. Mexicans enjoyed a bout of strength, but all the firmness fell away as disappointment succeeded the hopes raised concerning a real settlement in Mexico. Brazilians were adversely affected by the drop in the milreis that followed the outbreak of the revolution, although the latest news is rather more reassuring. A good many new issues have been made during the past six months in connection with electrical undertakings, at home and abroad. The majority have been taken readily by investors, although the most recent prospectuses failed to secure, in some cases, a full measure of public support. In consequence, several of the latest issues of these securities are quoted at a discount, the underwriters not yet having got out of their unwanted stock.

Share List of Electrical Companies.

HOME ELECTRICITY COMPANIES.

	Nom. £	Dividend. 1922.	Dividend. 1923.	Price Aug. 1, 1924.	Rise or fall.	Yield. p.c.
Brompton Ordinary	1	12	10	87/-	—	*£5 8 1
Charing Cross Ordinary	1	14	14½	41/3	—9d.	7 0 5
do. do. do. 4½ Pref.	1	4½	4½	17/-	—	5 6 0
Chelsea	1	10	12	97/6	—	6 8 0
City of London	1	15	15	45/9	—	6 11 0
do. do. 6 % Pref. ...	1	6	6	98/6	—	5 9 2
County of London	1	10	15	49/6	—	6 1 0
do. do. 6 % Pref. ...	1	6	6	1⅛	—	5 6 8
Edmundson's Ordinary	3	7	7	4⅝	—	4 6 1
do. 6 % Pref.	5	6	6	5⅝	—	5 11 7
Kensington Ordinary	5	12	14	9⅞	—	7 3 7
London Electric	1	10	10	81/-	—	6 9 0
do. do. 6 % Pref. ...	5	6	6	5⅝	—	5 11 7
Metropolitan	1	8½	10	1⅝	—	6 1 3
do. 4½ % Pref.	1	4½	4½	17/-	—	5 6 0
Newcastle-on-Tyne Ordinary ...	1	2½	6	18/9	—	6 8 1
do. 5 % Pref. ...	1	5	5	17/-	—	5 17 8
do. 7 % Pref. ...	1	7	7	25/6	—	5 9 10
Notting Hill 6 % Pref.	10	6	6	9½	—	6 6 4
North Met. Elec. 6 % Pref. ...	1	6	6	1¼	—	5 6 8
Urban Ordinary	1	—	4	18/3	—	4 7 8
do 6 % Pref. ...	1	5	6	1	—	6 0 0
St. James' and Pall Mall ...	5	14½	17½	13½xd	— ½	6 13 4
South London	1	11	15	43/3	—	6 18 7
South Metropolitan Pref. ...		7	7	1¼	—	5 12 0
Westminster Ordinary	5	12	15	10½	—	7 6 4
Whitehall Elec. Invst. 7½ % Pref.	1	7½	7½	19/6	—	7 13 10

HOME RAILS.

Central London Ord. Assented Stock	4	4	68½	—	5 16 10	
Metropolitan ... ... ,,	8½	4	81	— ½	4 18 9	
do. District ... ... ,,	3	3½	50½	—	6 18 7	
Underground Electric Ordinary	10	Nil	Nil	2½	—	Nil
do. do. "A" ...	1	Nil	Nil	7/6	—	Nil
do. do. Income Bonds	5	6	99	—	*6 1 5	

TELEGRAPHS AND TELEPHONES.

Anglo-Am. Tel. Pref. ... ... Stock	6	6	103xd	+ ½	5 16 6	
do. Def. ... ... ,,	1½	1½	23⅝	—	6 6 4	
Chile Telephone	5	6	6	5½	—	5 9 0
Cuba Sub. Ord.	10	7	7	7	—	10 0 0
Eastern Extension...	10	10	10	16	—	6 5 0
Eastern Tel. Ord.	Stock	10	10	161½	—	6 3 10
Globe Tel. and T. Ord.	10	10	10	17½	—	5 14 3
do. do. Pref.	10	6	6	11¼	—	5 6 10
Great Northern Tel.	10	24	22	27⅝	+ ⅛	8 0 8
Indo-European	25	7	7	82½	—	*5 6 1
Marconi	1	15	—	1 7/16	—	9 12 0
Oriental Telephone Ord.... ...	1	12	12	1⅞	—	*6 3 0
United R. Plate Tel.	5	8	8	6¾	—	*5 18 6
West India & Panama	10	Nil	Nil	1/-	—	Nil
Western Telegraph	10	10	10	16⅛	—	6 4 1

HOME AND FOREIGN TRAMS, &c.

Anglo-Arg. Trams First Pref....	5	12½	5½	9⅛	— ⅛	8 16 0
do. do. 2nd Pref. ...	5	5½	6	21/32	— ⅛	10 13 4
do. do. 5% Deb. ...	Stock	5	5	73½	—	6 16 0
British Electric Traction Ord. ...	,,	5	6	92½	—	6 9 9
do. do. 6% Pref. ...	,,	6	6	103	—	5 16 6
Brazil Traction	100	4	4	53	+4	7 11 0
Brit. Columbia Elec. Rly. Pcs.	Stock	5	5	87½	—	5 14 3
do. do. Preferred	,,	5	9%/-	82½	—1	*5 5 8
do. do. Deferred	,,	8	12%/-	102½	—	*6 8 0
do. do. Deb.	,,	4½	4½	81½	—	5 4 4
Lond. & Sub. Trac. 5 % Pref. ...	1	5	2½	6/-	—	8 6 8
London United Tram. Deb. ...	Stock	4	4	45½	—1½	8 15 10
Mexico Trams. 5% Bonds ...	—	Nil	5	66	—1	7 11 6
do 6% Bonds ...	—	Nil	Nil	45½	—	Nil
Mexican Light Common ...	100	Nil	Nil	16	—	Nil
do. Pref.	100	Nil	Nil	43	—	Nil
do. 1st Bonds ...	—	5	5	68½	—	7 17 6

MANUFACTURING COMPANIES.

Babcock & Wilcox...	1	20	12	48/-	+6d.	*5 0 0
British Aluminium Ord.... ...	1	5	5	25/9	—	3 17 8
British Insulated Ord.	1	15	15	2⅝	—	5 14 3
Callenders	1	15	15	52/6	+6d.	5 15 5
do. 6½ Pref....	1	6½	6½	28/3	—	5 11 10
Crompton Ord.	1	5	Nil	7/16	— ⅛	8 17 10
Edison-Swan	4/-	7½	—	5/-	—	6 0 0
do. ,, 5% Deb.	Stock	5	5	75½	—	6 12 5
Electric Construction	1	10	10	1 7/16	—	6 19 0
English Electric	1	8	5	15/3	—6d.	6 1 2
do. do. Pref.	1	6	6	19/6	—	6 3 1
Gen. Elec. Pref.	1	6½	6½	23/-	—	5 13 1
do. Ord.	1	5	5	17/9	—	5 12 7
Henley	1	15	15	2½	—	5 11 6
do. 4½ Pref.	5	4½	4½	4½	—	5 6 0
India-Rubber	1	10	5	1½	—	*7 5 6
Met.-Vickers Pref....	2	8	8	2 7/16	—	6 11 2
Siemens Ord.	1	5	—	18/9	—	5 6 8
Telegraph Con.	12	20	20	34½	—	*4 17 7

* Dividends paid free of Income Tax.

Market Quotations for Chemicals and Metals.

IT should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general and they may vary according to quantities and other circumstances.

CHEMICALS, &c.	Price Aug. 5.	Fortnight's Inc. or dec.
a Acid, Oxalic ... ... per lb.	5½d.	...
a Ammoniac, Sal ... ... per ton	£60	...
a Ammonia, Muriate (large crystal) ,,	£52	...
a Bisulphide of Carbon ... ... ,,	...	...
a Borax ... ... ,,	£25	...
a Copper Sulphate ... ... ,,	£25 10s.	...
a Potash, Chlorate ... ... per lb.	4d. to 4½d.	...
a ,, Perchlorate ... ... ,,	4½d.	...
a Shellac ... ... per cwt.	£15 15s.	...
a Sulphur, Sublimed Flowers ... ,,	£7 15s.	...
a ,, Roll ... ... ,,	£7 15s.	...
a Soda, Chlorate ... ... per lb.	3d.	...
a ,, Crystals ... ... per ton	£5 to £5 5s.	...
a Sodium Bichromate, casks ... per lb.	4½d.	...
METALS, &c.		
b Aluminium, Ingots ... ... per ton	£125 to £130	...
b ,, Wire ... ... per lb.	1/9 to 2/6*	...
b ,, Sheet ... ... ,,	1/6 to 2/-	...
p Babbitt's Metal and Anti-friction Metal—		
Grade I ... ... per ton net	£220	£2 inc.
Grade II ... ... ,, ,,	£164	£2 inc.
Grade III ... ... ,, ,,	£90	...
c Brass (rolled metal 2' to 12' basis) per lb.	9½d.	½d. inc.
c ,, Tubes (solid drawn) ... ,,	1/- to 1/0½	½d. inc.
c ,, Wire, basis ... ... ,,	10½d.	½d. inc.
c Copper Tubes (solid drawn) ... ,,	1/1½	½d. inc.
c ,, Bars (best selected) ... per ton	£94	£2 inc.
c ,, Sheet ... ... ,,	£94	£2 inc.
c ,, Rod ... ... ,,	£94	£2 inc.
d ,, (Electrolytic) Bars ... ,,	£87 10s.	20s. inc.
d ,, ,, Sheets ... ,,	£143 10s.	...
d ,, ,, Wire Rods ,,	£77 10s.	20s. inc.
d ,, ,, H.C. Wire per lb.	9½d.	½d. inc.
f Ebonite Rod ... ... ,,	2/- to 3/6	...
f Sheet ... ... ,,	2/- to 3/6	...
a German Silver Wire ... ... ,,	2/3	...
h Gutta-percha, fine ... ... ,,	7/6	...
b India-rubber, Para fine ... ... ,,	1/0½	½d. inc.
Iron Pig (Cleveland Warrants) ... per ton.	£5 2s. to £5 2s. 6d.	...
i ,, Wire, galv. No. 8, P.O. qual. ,,	£25	...
g Lead, English Pig ... ... ,,	£34	...
g Mercury ... ... per bot.	£12 15s. to £13	...
e Mica (in original cases) small ... per lb.	3d. to 3/-	...
e ,, ,, medium ,,	4/- to 8/-	...
e ,, ,, large ... ,,	10/- to 20/- & up.	...
p Phosphor Bronze, plain castings ,,	1/3½	...
p ,, ,, drawn bars & rods ,,	1/8	...
p ,, ,, rolled strip & sheet ,,	1/5½	...
p ,, ,, wire ... ... ,,	1/3½	...
o Platinum ... ... per oz.	£26	...
d Silicium Bronze Wire ... ... per lb.	1/0½	...
r Steel, Magnet, in bars ... ... ,,	8d.	...
n Tin, Block (English) ... ... per ton.	£258 to £258 10s.	£11 inc.
n ,, Wire, Nos. 1 to 16 ... ... per lb.	3/11	3d. inc.

*For 1 cwt. lots. Special quotations against definite specifications.

Quotations supplied by

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
p C. Clifford & Son, Ltd.
r W. F. Dennis & Co.

Electrical Development in Germany.—In a recent article which he contributed to the *Daily Mail*, M. Raymond Poincaré, former President and Prime Minister of France, pointed out that one of the most striking signs of Germany's increased prosperity is *the unceasing growth of the use of electricity*. During the war, for the necessary manufacture of guns and munitions, Germany was obliged to multiply her electrical plant and to utilise and improve her resources of lignite and hydraulic power. This task thus begun has been resolutely carried forward after the war. Thanks to the exceptionally favourable financial conditions brought about by the rapid depreciation in the value of the mark important companies for the production and distribution of power were able to issue, in order to pay for their expansion of plant, successive series of new debentures, which they have easily redeemed. The consequence is that the capacity of the central electric power stations, which in 1913 was 2,018,380 kW, reached in 1924 3,396,010 kW, which represents an all-round increase of 70 per cent. To take a few striking instances: The Bavarian hydraulic power groups have increased from 50,000 kW in 1913 to 350,000 kW this year; the power stations working with lignite fuel have quadrupled their output since the war; the Goldenberg-Essen group has increased from 45,000 kW in 1913 to 290,000 kW in 1924; the Grosskraftwerke Frankfen has increased from 6,800 to 63,000 kW; the Berlin Central Electric Werke has grown from zero to 204,250 kW, and so on.

Radio in the Air.—A message from Berlin reports that the radio apparatus of the new Zeppelin airship which is being built for America has a telegraphic range of over 1,500 miles and a telephonic range of 300 miles. The antennæ are fan-shaped, and the three hanging wires are 400 ft. long. Power is derived from an air screw-driven generator.

Some of the Exhibits at Wembley.

Messrs. Johnson & Phillips, Ltd.

(Stand No. 29, Avenue 10, Bays 15 and 16.)

This exhibit is comprised of cables, switchgear, transformers, and overhead line material. The principal items in the first

Fig. 178.—A Johnson & Phillips Weather-proof type Transformer.

class are two samples of the 0.25 sq. in. single cable, used in the electrification of the Brighton Section of the Southern Railway. The samples have been submitted to e.h.p. tests, one without being bent and the other after bending. The former was tested between the conductor and lead sheath earthed to 250,000 V, a.c., without breakdown; the other after being bent round a drum of 11 in. radius withstood 200,000 V, a.c. Another cable sample shown is a section of 3-core, 0.2 sq. in., paper-insulated cable, designed for working at 33,000 V. A length of this successfully withstood a test pressure of 100,000 V between conductors and conductors and earth. Numerous other samples are on view, including parts of acid-proof cables and others manufactured for special situations.

The transformer section includes a weatherproof type for outdoor pole mounting (fig. 178). This is suitable for use where simple and inexpensive equipment is desirable to enable small consumers in outlying districts to be economically supplied. A transformer oil-testing equipment is exhibited.

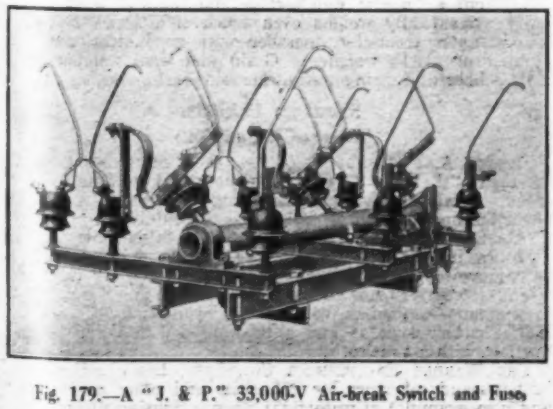

Fig. 179.—A "J. & P." 33,000-V Air-break Switch and Fuse.

This consists of a step-up transformer, a regulating auto-transformer, a regulating dial switch, a double-pole hold-in switch, a voltmeter with protective fuses, a pilot lamp and testing cup. The equipment gives a test pressure range of from zero to 40,000 V. To illustrate the various forms in which transformer windings are assembled a number of typical transformer coils are shown. These include the "cross-over" type for small and medium-sized transformers; the "section" type for heavy currents; and the "spiral" type in which single rectangular strip conductor is wound on edge. A complete winding of "section wound" coils is shown assembled on the limb of an actual transformer. This winding is provided with tappings which are brought to a tapping switch. A set of distance reading thermometers, by the Cambridge Instrument Co., Ltd., is installed on the stand. These are connected to three "J. & P." 5,000-kVA transformers in the power house and sub-stations, and indicate the loads upon these by thermal methods. A collection of samples of transformer oils complete, this part of the exhibit.

In the switchgear section is a "P Type" oil switch (fig. 181). This particular type ranges between 200 A at 33,000 V, and 1,000 A at 11,000 V. It consists of three single-pole units coupled together when necessary to form a three-phase switch. It can be arranged for either mechanical or electrical operation. It is fitted with a special power reduction mechanism so that the power required for tripping is very small. The tripping mechanism is arranged so that the switch can be tripped in any position of the closing movement when current is made. The switch can be fitted with either transformer-operated or direct-operated overload trip coils. When a time lag is required with the direct connected trip coils air vane time lag devices are fitted. No operating mechanism is exposed on the top of the oil switch frame, it is all situated underneath the frame and is, therefore, free from dirt, but the main feature of this is that this type of mechanism does not interpose earthed metal between the contacts on the top of the switch. The moving contacts are of the wedge shape, with self-aligning finger-type fixed contacts so arranged that on the occurrence of a heavy short circuit they tend to make more perfect contact and not be blown

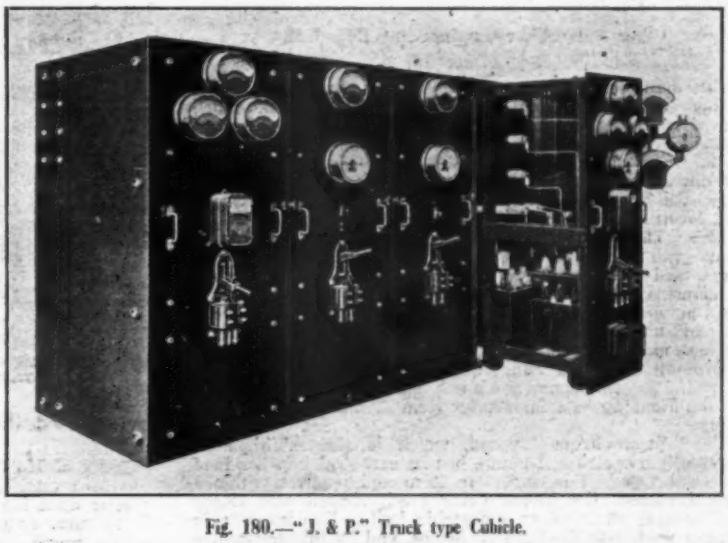

Fig. 180.—"J. & P." Truck type Cubicle.

out. The insulation throughout is of bakelite, and the bushing type insulators are fitted with a strong porcelain shield at the base so as to protect the bakelite from being damaged by arcing within the oil switch tanks. The switch has a long break having two in series per pole, a large head of oil, and a quick speed of arc rupture.

The "N Type" switch shown, similarly to the "P Type," is composed of three single-pole units. It is arranged for electrical operation. The control switch is of the push-button type and operates in conjunction with a suitable contactor, which is mounted close to the oil switch and ensures that the operator will not burn out the closing solenoid or inadvertently re-close the oil switch after it has been closed on a fault and tripped automatically during the operation. As soon as the operator has pressed the button the control is taken entirely out of his hands until the switch is fully closed. A typical truck-type cubicle (fig. 180) is on view. This is of the "B.3" pattern for 500 A at 6,600 V, or 300 A at 11,000 V. The truck is mounted upon wheels fitted with ball bearings. When the truck is withdrawn the oil switch, current and potential transformers, all instrument terminals and wiring, are rendered easily accessible for examination, cleaning,

tightening-up, &c. An improved type of oil switch is fitted. The overhead line equipment shown includes horn gap arresters, choke coils, switches, expulsion-type fuses, &c.

Fig. 179 illustrates a 33,000-V air-break switch and fuse which is exhibited

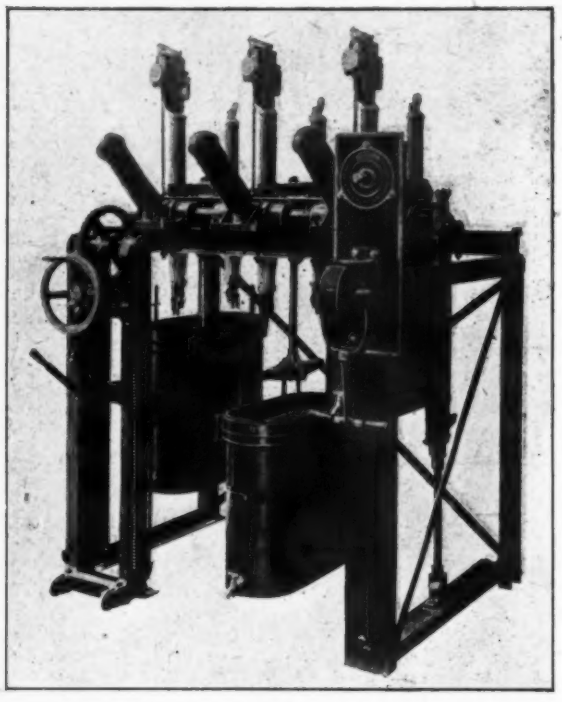

Fig. 181.—The Johnson & Phillips "P Type" Oil Switch.

In addition to these exhibits the company shows junction boxes, dividing boxes, plug boxes and other cable accessories.

The Pulsometer Engineering Co., Ltd.

(*Stand No.* 102, *Bays* 14 *and* 15, *Avenues* 3 *and* 4.)

This stand has a waterfall, a striking arrangement consisting of a receiving tank on the floor level, from which the water is raised by a centrifugal pump to an overhead tank, the overflow being carried over a weir and returning in the form of a waterfall to the receiving tank below. A Pulsometer flow indicator is fitted in the delivery pipe to show the rate of discharge; the latter is a simple, cheap, and effective method of measuring the water flowing through a pipe. The exhibit is representative of the wide range of pumps and refrigerating machinery which the firm manufactures, and the selection of pumps shows the great variety of adaptations for many classes of work of which the centrifugal pump is capable. The Pulsometer steam pump is shown. This has no working parts except the simple valves, and will work in almost any position. It requires no foundation, and will pump as readily hanging from a chain as fixed to the ground. For emergency work it is particularly suitable, as it can be fitted up in a far shorter time than almost any other pump.

The "Stereophagus" pump, which is also exhibited, is essentially a centrifugal pump, but its cast-steel impeller is of a special type. It is conical in form and revolves within a conical casing, the blades being scroll shaped and sloped to the same angle as an adjustable knife. The latter is in close contact with the impeller blades, and by this scissor-like arrangement all solid matter passing up the suction pipe is cut to a size suitable for the passages of the pump and the delivery pipe. The pump is intended for dealing with unscreened sewage, and will pump tin cans, blocks of wood, &c., as well as rags, string, fibres, &c., which cause so much trouble in an ordinary pump by winding themselves round the spindle and so causing the pump to stop. The suitability for automatic operation of this pump is a very important feature. The switchgear is operated by positive rods and levers to which copper floats are attached, the latter rising and falling with the sewage. When a certain level is reached, and the pilot circuit is closed, the automatic starter is set in motion, and the pump started up, and when the sewage falls to a predetermined level, the motors are stopped in a similar way.

The Pulsometer ring pump has been designed to work at high speeds and to operate silently. In essence it is a high-speed reciprocating pump, the valve seats of which are made in one casting in the shape of a cage surrounding the plunger. Grooves are cut in this cage, with slots in the bottom forming the waterways, and the valves consist of rubber rings placed over these slots, the suction valves being placed in the internal grooves and the delivery valves in the external grooves.

The Pulsometer range of turbine pumps for high heads up to 3,500 ft. is very complete, and the pumps can be supplied with any desired number of stages. A cross section shown on the stand gives a good idea of the internal construction and operation. Various patterns of these pumps are used for different applications, including irrigation, for handling the slurry at coal washeries, &c.

Among the power plant equipment shown are an extraction pump for condensate, and the "H.S.L." pump for general circulating purposes. These pumps are split on the horizontal line, a feature which facilitates opening up for inspection as well as the removal of the internal parts without the necessity for breaking pipe joints.

The refrigerating plant shown includes an ammonia twin compressor and the "Criton" hand ice machine for small applications.

A laboratory type of the well-known "Geryk" vacuum pump is represented in the exhibit. These single-cylinder pumps are capable of giving a vacuum up to 1/50th m/m from perfect, but for higher vacua the R.L. type is recommended. Pumps of the latter type are tested to .00001 m/m before leaving the works, and .000001 m/m is frequently obtained in the tests (measured on a McLeod gauge).

Messrs. W. & T. Avery, Ltd.

(*Stand No.* 153, *Avenues* 2 & 3, *Bay* 10.)

A number of weighing and testing machines are exhibited by this company. The general public is appealed to by an electric weighing machine which gives a record at a distance of weights placed upon the platform.

Among the other weighing machines is an automatic type for liquids, suitable for the measurement of fuel oil, &c. The machine has a hopper which is discharged by overturning, thus doing away with valves which are liable to stick. Two or three machines employing the beam principle are on view.

One of the testing machines shown is the impact testing machine illustrated in fig. 182. This is used for carrying out the "Izod" brittleness test on steel samples, and has a

Fig. 182.—An Avery Impact Testing Machine.

capacity of 120 ft.-lb. The energy imparted to the specimen by the swinging pendulum is immediately indicated by the pointer upon the graduated quadrant. The normal specimen is 10 mm. square in section, but supplementary tools to enable round specimens to be tested can be supplied. A smaller size of machine is also made.

A patent automatic weighbridge and totaliser is exhibited. This automatically weighs each truck of a series and gives a total upon a counter, together with an indication of the number of trucks weighed. Grain and wool weighers, and india-rubber and spring testing machines complete the exhibit.

Showcase Exhibits.

(*Avenues* 13*a and* 14.)

MESSRS. A. P. LUNDBERG & SONS show numerous examples of their "Lektrik" switches, plugs, and sockets, &c., in wood, metal, and various insulating materials. A number of switch boxes for flush fitting are also exhibited.

MESSRS. J. A. CRABTREE & CO., LTD., also show tumbler switches in a variety of patterns and finishes, as well as artistic switch plates, &c.

THE RECORD ELECTRICAL CO., LTD., displays a number of instruments—ammeters, voltmeters, ohmmeters, &c.; an automatic battery switch; and a 100-A, 600-V automatic circuit breaker with a time-setting device.

THE WARDLE ENGINEERING CO., LTD., has a collection of lanterns and reflectors for industrial and other applications and also examples of watertight electric lighting fittings

MESSRS. WORSNOP & CO., LTD., exhibit "Alklum" nickel-iron accumulators, and show their application to hand lamps, miners' electric safety lamps, &c.

MESSRS. W. LUCY & CO., LTD., have on view a number of contactor switches, porcelain-handled switch fuses, &c.

THE ELECTRICAL APPARATUS CO., LTD., is represented by a single exhibit—a 60-h.p. "Vauxhall" motor-control pillar for 220 V, with an ammeter mounted on the top of the case.

MESSRS. BENHAM & SON, LTD., show their "Electro-Vapour" apparatus, including towel rails, radiators, a bath-spray, &c. A number of separate immersion heaters are also contained in the case, and one of these is shown applied to an urn.

MESSRS. HENRY WIGGIN & CO., LTD., show several "bobbins" of resistance wires for electrical purposes.

MESSRS. D. H. BONNELLA & SON, LTD., exhibit artistic automobile lighting and other fittings, pushes, tumbler switches, &c.

MESSRS. H. CLARKE & CO. (MANCHESTER), LTD., show radio apparatus and accessories, including coils, coil-holders, condensers and terminals, and samples of micanite and other insulating materials.

THE DIAMOND FIBRE CO., LTD., displays samples of red and black fibre for insulation and other purposes.

LITHOLITE INSULATORS, LTD., shows manufactured litholite in the form of switch handles and covers, telephone terminal boxes, plugs and sockets, &c.

THE BROMPTON & KENSINGTON ACCESSORIES CO., LTD., shows one of its electric cookers, which has a total loading of 6 kW—oven, 1,500 W; two boiling rings, 1,600 W; and a 1,300-W grill.

MESSRS. EDWARD MACBEAN & CO., LTD., exhibit "Dundas" insulating silk and cambric in sheets and strips.

MESSRS. RICHSON & CO., LTD., display a number of examples of ornamental glassware, including electric table standards, &c.

A Yarrow Boiler Installation.

MESSRS. YARROW & CO. (1922), LTD., have recently concluded an agreement with Koninklijke Maatschappij "de Schelde," Flushing, Holland, by which the latter company can build the Yarrow patent water-tube boiler (land type), and considerable interest has been taken in this boiler in Holland. This

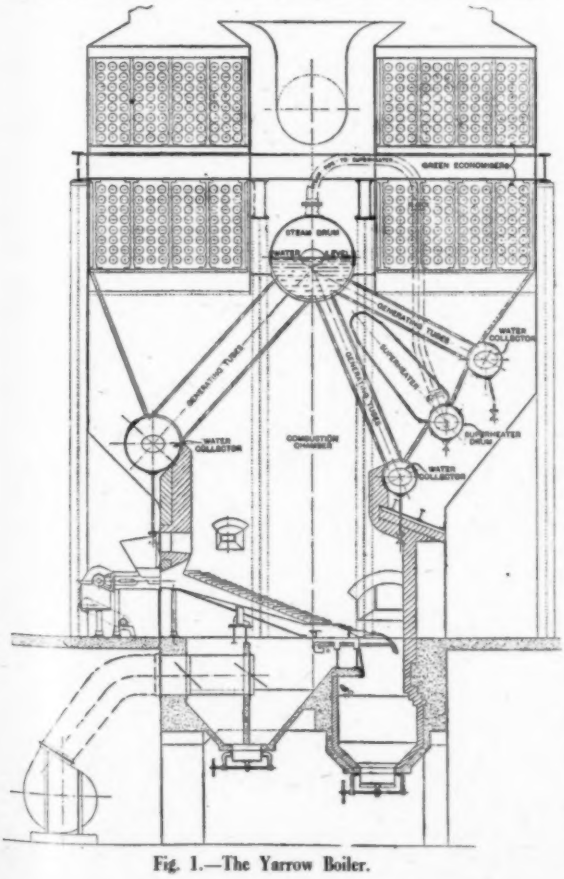

Fig. 1.—The Yarrow Boiler.

firm has recently received an order for a Yarrow boiler to be installed at the electric power station at Geertruidenberg. Messrs. Yarrow & Co. are supplying the pressure parts from their Glasgow works, but otherwise the construction and erection of the boiler are being undertaken by their Dutch licensees.

The advantages of the Yarrow boiler have been readily appreciated by the authorities at the Geertruidenberg station, who have been particularly impressed with the large combustion chamber, ensuring complete combustion; the large heating surface exposed to direct radiation; the absence of bolted joints throughout the boiler; and the rapid circulation of water in all the tubes, due to their being straight and well inclined, allowing the boiler to be forced to high overloads.

The accompanying drawing shows the general arrangement of this boiler, from which it will be seen that there is one saturated steam drum, one superheated steam drum, and three water drums. The superheater is placed at the back of the boiler only, and in order that the gases passing through the superheater may be at the required temperature the generating nest of tubes at the back of the boiler is divided into two parts, the superheater being located between them. A Green Tri-tube economiser is superimposed, being carried on the boiler supporting structure, so that the whole unit is self-contained. This economiser is arranged in two equal parts, one at the front and one at the back, each utilising the heat contained in the flue gases. From the outlet of the economisers a flue leads in the usual way to the induced-draught fan. The stoker is of the Riley type, manufactured and supplied by the Fama Company, Paris.

The generating surface of the boiler is 7,500 sq. ft., and the superheating surface 2,200 sq. ft., which together with the economiser surface of 6,450 sq. ft., makes a total of 16,150 sq. ft. The boiler is designed for a working pressure of 256 lb. per square inch, superheated to 725 deg. F., and is designed for a normal evaporation of 50,000 lb. per hour, but is capable of dealing with a big overload.

The design of the boiler is similar to that of a number which have been, and are being, installed in this country for electric power stations and other industrial plant, such, for instance, as the County of London Electric Supply Co.'s station at Barking, where a number of Yarrow water-tube boilers are being put in; these boilers have also been installed by the Liverpool, Brighton, Londonderry, and Gravesend Corporations, Newcastle-on-Tyne Electric Supply Co., Messrs. J. and P. Coats, Paisley, The Burmah Oil Co., The Westburn Sugar Refineries, &c.

The illustration gives a good idea of the large combustion space and the large surface exposed to direct radiation, which are important characteristics of the Yarrow boiler.

The South-East Lancashire Advisory Board.

Annual Report.

THE report of the South-East Lancashire Electricity Advisory Board to the Electricity Commissioners, covering the year ended March 31st last, has been formally approved.

The report contains a list of the bodies represented on the Board, together with their nominees. The electricity undertakers and other bodies who constitute the Board number forty, and include two railway companies, the L.M.S. and the L. & N.E. The Engineering Advisory Committee consists of eleven engineers, under the chairmanship of Mr. S. L. Pearce, of Manchester. There is also a Finance Committee of seven members of the Board. The first part of the report of the proceedings covers the activities of the Interim Board which came into being on July 11th, 1922, and functioned until the formation of the Statutory Board by Parliament on May 28th, 1923. This Interim Board approved a number of bulk supply contracts involving an aggregate demand of 48,000 kW (including an interchange of 1,500 kW between the Lancashire Electric Power Co. and Wigan Corporation). The largest single contract was for the supply of 20,000 kW by the Manchester Corporation to the Lancashire Electric Power Co. for a 7-10-year period. The Corporation also entered into a 10,000-kW agreement with the Stretford Urban District Council. The Engineering Advisory Committee has formulated a set of principles which should govern the charge for bulk supplies to which all the contracts approved conform. Extensions to generating plant totalling 7,850 kW and to secondary plant aggregating 32,600 kVA were approved. Ten extensions of mains were sanctioned, including lengths of 0.2 and 0.3 sq. in., 33,000-V mains. Decisions as to the source of supply for outlying districts were also made by the Engineering Advisory Committee, which, in addition, supported a number of applications for Electricity Orders by local authorities.

The Statutory Board approved further bulk supply contracts to the extent of 5,800 kW; the largest was for the supply of 5,000 kW by the South Lancs. Tramway Co. to the Atherton Urban District Council. The extensions sanctioned were the installation of a 4,000-kW and a 2,000-kW turbo-alternators by the South Lancs. Tramway Co., and an addition of a 200-h.p. Diesel engine and a 100-kW motor-generator to the plant of the Alderley and Wilmslow Electric Supply, Ltd. Four extensions of mains were approved, the sources of supply determined for three local authorities, and applications for three orders were supported. The Board also sanctioned the transfer of four Orders held by local authorities to the Oldham Corporation for a period of 30 years. A proposal to erect a

new station at Hartshead by the Stalybridge, &c., Board was investigated. It was proposed to install initially two 7,500-kW, 6,600-V, 3-phase, 40-cycle turbo-alternators, and the Board passed the scheme. A complete survey has been made of the agreements in force in relation to bulk supplies during week-ends and at night. The matter is under consideration, and a scheme will be submitted in due course. The question of the adjustment of running hours to secure economy in production has been investigated. Two stations—those at Altrincham and Eccles—were considered in particular, but it was not found possible to make any alteration. The case of the Ashton-under-Lyne station was postponed. A form has been issued to each constituent authority in Group 3 for use in taking a census of the demand in their respective areas; this has proved of great assistance to some of these authorities. To enable the Board to respect the statutory rights of the authorised undertakers in the area, a statement has been prepared, and standing orders have been drawn up to govern the proceedings of the Board.

The estimated expenditure of the Board during the year covered by the report was £3,000, but the actual expenditure only amounted to £1,969. This, when distributed over the amount of energy sold in the area during the year, *i.e.*, 479,076,857 kWh, yields a figure of 0.00099d. per kWh for the cost of administration of the Board.

In concluding the report the Board says that it is "gratified to report that, without exception, every proposal which it has made has subsequently received the approval or sanction of the Commissioners. Generally speaking, the creation of the Board has compelled the consideration of all electrical development from a broader standpoint in the interests of the District as distinguished from the previous practice of viewing such developments only from the point of view of the immediate locality concerned."

New Electrical Devices, Fittings, and Plant.

Readers are invited to submit particulars of new or improved devices and apparatus, which will be published if considered of sufficient interest.

The "H.C." Quick-make and Break Switch.

Figs. 1 and 2 illustrate the "H.C." quick-make and quick-break switch made by Messrs. L. Weekes, Ltd., Luton, Beds. This switch is rated for 15-A at 250-V, but it can be used on 500-V circuits to take a maximum of 10-A. Large wiring spaces are provided and the gear is substantially enclosed in

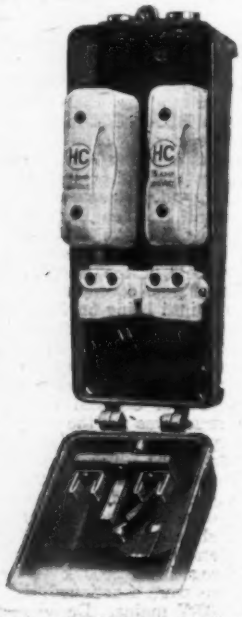

Fig. 1.—"H.C." Switch (exterior). Fig. 2.—"H.C." Switch (interior).

an iron case and is "foolproof." It is supplied with substantial vented porcelain fuse holders and bridges, and it will carry and break a current 50 per cent. in excess of its rating, the spring contacts being of large-section h.d. and h.c. copper. Screwed insulating bushes are fitted which are removable when conduit is used.

The "Valley" Battery Charger.

The "Valley" battery charger (fig. 3) made by the General Electric Co., Ltd., Magnet House Kingsway, W.C.2, for operating from a.c. lighting circuits is of the vibrating reed type.

It consists essentially of two portions, a transformer, the secondary of which is tapped to supply circuits at 2, 6, 12 and 24 volts respectively, and the rectifying element. The latter is comprised of a compound magnetic circuit composed of a permanent magnet and a small electromagnet energised by the a.c. supply, and a vibrating armature carrying a silver plate which makes contact during alternate half-cycles with a heavy carbon contact. The moving portion of the apparatus is mounted on a slate base on the top of the case containing the transformer, and, together with a replaceable fuse in the battery circuit, is protected by a moulded glass cover. The front of the instrument is a panel of bakelite carrying a flush type ammeter which indicates the value of the charging cur-

Fig. 3.—The "Valley" Battery Charger.

rent, clearly marked terminals for connecting 2, 6, 12 or 24-V batteries, and a switch for varying the charging rate of 24-V batteries being charged in parallel.

The apparatus is made with two standard windings, one for operating on 50-cycle circuits at voltages between 100 and 125, and the other for 50-cycle circuits between 200 and 250 V. Chargers for non-standard periodicities between 25 and 65 cycles can be specially made. The standard apparatus charges 2-V and 12-V batteries at approximately 3 amperes, 6-V batteries at 6 amp., and 24-V batteries at approximately from 0.1 to 0.4 amp. The instrument is connected to the a.c. supply by an ordinary lampholder or wall plug while the accumulator is connected to the appropriate terminals on the front of the machine. The employment of a permanent magnet in the magnetic system fixes the polarity, and the silver-carbon combination used for the contacts reduces the necessity of adjustment to the minumum.

The "Ledway" Connector Box.

We have received from Messrs. W. R. Thornton & Son, Ltd., Barrow-in-Furness, a sample of the "Ledway" connector box, which is claimed to be the only all-lead box supplied for wiring purposes. It consists of a two-part lead shell secured by two tinned bonding screws at each gland. By this means direct contact is established between the box and the lead of the cable, giving perfect continuity for earthing purposes. The box contains a loose base plate of insulating material in the centre of which is a spindle. The connectors which are cross-shaped and of brass, are slipped over this spindle and separated from one another by micanite disks. In the box entries are a series of three fins which can easily be pared to accommodate any size of cable up to 7/.029.

A Single-Unit 110,000-Volt Insulator.—What many engineers regard as an epoch-making contribution to the art of transmission was announced at the A.I.E.E. convention in Worcester, U.S.A., in June, by Prof. H. B. Smith. He described and exhibited a new type of insulator proposed for high-pressure systems, provided that field-service tests give results corresponding to laboratory tests. The striking character of the insulator lies in its use of metal and wood, its design for operating at 110,000 volts per unit, its close ratio of wet and dry breakdown values and its conformation to utilise field effects to a maximum degree. From a technical standpoint it is fundamentally sound; its questionable features are those associated with service conditions. The tendency for wood to carbonise has prohibited its use in the past, for any initial carbonisation originating from leakage or static tends to continue and spread. Prof. Smith claims that the impregnation process and design used will prevent any carbonisation in the proposed insulator. In addition, it possesses possibilities in maintenance that may economically permit of stick replacements at intervals.—*Electrical World.*

Parliamentary.

[By Our Special Parliamentary Reporter.]

Electrical Development.—On July 31st, Mr. SNOWDEN, the Chancellor of the Exchequer, during the discussion on the vote for the Ministry of Labour, dealt with the Government schemes for the relief of unemployment. He said that the Government had not given up the hope of inducing the railway companies to do much more in the way of electrification of their systems, and it was continuing to put on them all the pressure which it could bring to bear in the hope of obtaining some practical result. After outlining the Government plans for new road construction and the construction of a tubular bridge across the Tay (on which preliminary engineering investigations were to be made), Mr. Snowden dealt with the conservation of coal. The problem was to devise means by which, on a commercial scale, as much as possible of the 140,000,000 odd tons of coal burned in this country every year might be so treated as to reduce waste. All the best brains and the most expert knowledge in the country were now engaged on this problem. The Mines Department had asked for additional funds for a survey of the coal seams of the country by means of chemical and physical tests.

COMPULSORY POWERS FOR COMMISSIONERS.

Coming to the possibilities of electrical development Mr. Snowden said that the Government was convinced that intensive development of electricity on sound business lines would help perhaps more than any one thing to achieve the objects in view. The idea which the Government had in mind was not to treat this work primarily from the point of view of finding work for the unemployed, but to carry out big schemes which would be useful, and in that way it would be helping to lessen the volume of unemployment. But he warned the House that these schemes would be expensive. After referring to the backwardness of Great Britain with regard to electrical development, the Chancellor said that there had been considerable progress during the last three years since the passing of the emasculated Electricity (Supply) Act of 1919. Since that year the capital invested in electrical undertakings in this country had risen by 43 per cent., generating plant by 60 per cent., and energy produced by 24 per cent. The opposition to progress came not only from the private companies, but also from the municipalities, which were frequently very parochially-minded. The Electricity Commissioners had done wonders when one remembered their limited powers. The Commissioners had been very much hampered by the lack of compulsory powers, and in spite of the considerable progress that had been made in co-ordinating systems in different parts of the country, the Government was of opinion that the powers proposed in 1919 should be given to the Electricity Commissioners by legislation. It was proposed, possibly in the autumn session, certainly early next session, to introduce a Bill proposing to restore these powers.

STATE-AIDED STANDARDISATION OF FREQUENCY.

There was no more instructive illustration of the chaotic way in which our electrical development had taken place than the variety of frequencies. Unless power was produced at a uniform frequency, it was very difficult to link up stations. The idea was to keep the power at a standard frequency in all the large stations from the Clyde to the South of England, and provide inter-communication. The change over to one standard of frequency would be a very big work, but the Government was going to recommend that the State should undertake that work. It would not be done unless the State undertook it, because it was not to the financial advantage of the companies and authorities to incur that expenditure. The advantages of standardisation would be that the manufacturers would be able to reduce the number of their patterns and stocks, and there would be a cheapening of the cost of production. He understood that if there was one frequency—say a frequency of 50—all over the country, the manufacturers of electrical apparatus would be much better able to compete in the market than they were at present, and intercommunication between the large power stations would cheapen the cost of production very considerably. The Government, on the advice of its experts, was convinced of the extreme importance of this point. It had authorised the greatest expert on electricity in this country to enter into negotiations with the municipalities and the power companies and to offer to them certain suggestions. This expert should be empowered to hold a conference of the various electricity concerns in the country with a view to securing their support in obtaining a uniform frequency and also with regard to transmission lines. If the Government gathered in the course of the debate that day that the House approved of its proceeding on those lines, then as soon as it had got the report of this expert, it would feel that it was empowered to embark on the work of standardising frequency. It would be a big job which would take probably three years, and the approximate cost might perhaps be something like £10,000,000 spread over the three years.

TRANSMISSION LINES.

Dealing with transmission lines, Mr. Snowden said that to produce electricity cheaply it was necessary to concentrate generation in large stations and then distribute at high pressure to sub-stations. The high cost of transmission lines was the great obstacle to development and tended to delay the work. If electrical development was to be accelerated, cables should be laid down well in advance of immediate requirements, and this was a field suitable for State enterprise. He was told that there was hardly a case in existence where transmission lines had been laid in country districts and through long distances ahead of requirements in which the expense had not either been wholly or to a great extent borne by the State. The Government was convinced that it would not be done in this country unless the State shouldered at least a great part of the financial burden. The Government therefore suggested that the Electricity Commissioners should be authorised to hold a conference of the Incorporated Municipal Electrical Association, the Associated Power Companies and the Provincial Electric Supply Committee of Great Britain with a view to securing the maximum possible development of a main transmission system on the following terms: The work must be of a kind which the undertakers had no intention in the near future of carrying out with their own resources and must not be accelerated work in the ordinary sense of mere additions to or extensions of schemes already in operation. The financial assistance to be given was a system of grants to those authorities undertaking approved works individually or jointly, sufficient in amount to make up the net revenue (after allowing for depreciation or sinking fund) attributable to the particular work, at a rate of interest to be fixed by the Treasury, on the expenditure incurred until such time as the net revenue was sufficient to meet the charges, but not for more than ten years.

ELECTRICITY IN RURAL DISTRICTS.

Turning next to the development of electricity in rural areas, Mr. Snowden said that there was no instance either at home or abroad of any scheme of rural development which had been self-supporting. That was owing to the large amount of expenditure that had to be incurred for a small amount of revenue. The explanation of the cheap rural supplies abroad was that the electricity was generated by water power right away from the industrial centres and it had to be transmitted to the places where it was consumed. By that means they were able to give a cheap supply to the villages or houses along the line of transmission. The Government believed that this was a very important thing. Everyone agreed that it would add to the amenities of rural life. It would prevent the flow of population from the country districts to the towns and, what was perhaps more important, it would encourage the transfer of industries from large centres of population into the healthier country districts. It would serve for the lighting of cottages, it could be applied to domestic apparatus, and it would lighten the work of the household. In several other ways it would be a great advantage to the countryside. He felt that in this connection there must be some organisation for the distribution of the electricity. It might be possible, and he thought it would be necessary, to form some subsidiary organisation, but that would have to be to some extent subsidised by the State. There might, for instance, be the wiring of a house on something like the hire-purchase system. The Government's great idea was to adapt and adopt everything which might be necessary in order to provide electrical power in the country districts for power purposes and domestic use.

THE SEVERN BARRAGE.

The Government had decided to revive the Severn barrage scheme. If the scheme were carried to a successful issue, it would be one of the most difficult engineering feats which had ever been achieved in the history of the world. They must not rush into a thing like that without very careful preliminary investigation and the Board of Trade had formed a Committee to seek advice as to the nature and scope of the inquiries which would be necessary. The Treasury had agreed to the necessary expenditure. They were told that it would take two or three years to complete all the investigations that were necessary. Apart from the necessity of the engineers finding the proper foundation, it would be necessary to investigate and take note of the tides probably over a period of two years. The Government had sanctioned the whole of the expenditure necessary for carrying out full investigation, and this it was estimated might cost about £95,000.

The Pacific Cables.—On July 28th, Commander BELLAIRS asked the Postmaster-General whether he was aware that his predecessor promised on April 17th, 1923, to convey a representation to the Pacific Cable Board regarding the desirability of linking our Pacific cable with the American cables at Honolulu, whether he could state what reply was made, and whether the Pacific Cable Board was doing anything towards the duplication of the cable north of Fiji.

Mr. HARTSHORN said that the matter was brought to the notice of the Pacific Cable Board. He understood that the Board preferred to follow the present route, and was now considering whether the duplication north of Fiji should be by cable or by radio-telegraphy.

Clyde Valley Electrical Power Bill.—This Bill was considered by a Committee of the House of Commons on July 30th and 31st. The main objects of the Bill are to empower the Clyde Valley Electrical Power Co. to raise further capital, to convert existing £10 shares to £1 shares, to extend the limits of supply, and to empower the company to supply energy for lighting purposes, with the consent of the local authority concerned, to any premises within the area of supply to which the company has the right to supply electricity

for power purposes. There was opposition by the Glasgow Corporation with regard to a protective clause. (The proceedings in the House of Lords were reported in our issue of July 11th, p. 56.)

Mr. Rowand Harker (for the Clyde Valley Co.) said that the company had inserted a clause by which it undertook not to interfere with the statutory property of the Glasgow Corporation without consent, even though that property was not within the city boundary. The Corporation said that, although the protection under that clause might be sufficient in respect of existing works, the time might come when it would want to extent its gas undertaking or other statutory undertaking, and it wanted protection in this direction. It had never been the practice of Parliament to give protection to a public authority in respect of works which it might carry out in the future. If the demands of the Glasgow Corporation were conceded it would mean that, if the company had mains under streets in any area in which the Glasgow Corporation wished, in the future, to lay gas or water mains, or other services, the Corporation could require the company to remove its mains and lay them where the Corporation wished them to be laid, and pay the costs itself.

Mr. R. Robertson (a director of the company) said that the clause in the Bill provided the most ample protection.

Cross-examined by Mr. M. P. Fraser, K.C. (for the Corporation), Mr. Robertson said that the clause in the company's 1901 Act, for the protection of the Corporation, was a special case, and was not imposed on the company by a Committee of Parliament, and in that respect it was never looked upon in Parliamentary procedure as a precedent.

Mr. J. L. Mackenzie (solicitor and Town Clerk Deputy, Glasgow) said that the clause in the 1901 Act was included in the company's Act of 1904, when the company secured minor powers in comparison with those sought in the present Bill. Also, in the Act secured by the Glasgow Corporation in 1912, dealing with the alteration of the Glasgow boundaries, a similar clause was inserted for the protection of the company.

Mr. M. P. Fraser, K.C., addressing the Committee on behalf of the Corporation, said that he foresaw also the possibility of the company's laying mains in such a way as would prevent access by the Corporation to its own property. He did not agree unconditionally with the principle of "first come, first served," as put forward by the company, and said it was the rule of Parliament, where a municipality was performing a public service, to give it preference over undertakers who were not performing similar duties. A municipal public ufility service should not have to bear expenses resulting from the activities of private enterprises.

Mr. F. W. Wrottesley (replying on behalf of the company) said there was no distinction between the services provided by the company and the Glasgow Corporation. In the 1901 Act, the company received compulsory powers in the counties dealt with. Glasgow had refused to give the company compulsory powers in its area, however, but if it was prepared to grant these, then the company would endeavour to agree to a further protection clause.

The Committee decided that the clause in the present Bill, by which the company undertook not to interfere with the Corporation's property, should remain, and refused to give the Corporation the wider clauses asked for, as in the 1901 Act. (This decision agrees with that given in the House of Lords, when the Corporation opposed on the same grounds.)

The Bill came before the House of Commons on August 4th. A motion for its rejection was defeated and the Bill was read a third time.

Lanarkshire Hydro-Electric Power Bill.—The House of Commons Committee upon this Bill resumed its proceedings on July 29th, when Mr. R. Robertson (a director of the Clyde Valley Electric Power Co.) handed in a list of prices charged for electricity in the area. This showed that the Clyde Valley Co. and its subsidiary, the Strathclyde Electric Supply Co., charged 4½d. per kWh for lighting houses, and 5d. per kWh for shops. The charge to small power users was 2½d. per kWh. All the other suppliers in the district charged at higher rates, with the exception of Glasgow Corporation, whose charges were the same as those charged by the Clyde Valley Co. in areas where it supplied on behalf of the local authorities. Another statement showed that for an aggregate of 21 million kWh supplied in 1923 to distributors the Clyde Valley Co. received an average of 0.616d. per kWh. Mr. Robertson said that the prices would not be materially affected by the hydro-electric plant as it would be only a small part of the company's system.

Mr. Ralph Bury said that his client, Sir Charles Ross, was an engineer with Canadian experience. He further stated that the amounts set down in the Bill for compensation to riparian owners were bribes to "buy off" opposition. The scheme would not be financed so cheaply as it should be. There was no method of checking prices to be charged by the English Electric Co., Ltd., and Sir William Arrol & Co., Ltd. The working costs of the plant had been withheld from the Committee, but Sir Charles Ross calculated that with 6,000 kW as a basis the cost of the kWh at the switchboard would be 0.042d. Under the Bill it was proposed to charge a standard price of 2½d. per kWh, and the standard dividend of 8 per cent. could be increased as the charge was reduced. If the Lanarkshire Co. sold energy to the Clyde Valley Co. at ½d. per kWh, it would be able to pay a dividend of 24 per cent. on its ordinary shares. On the other hand, Sir Charles Ross did not wish to make money out of his scheme; he was willing to promote a Bill next session to enable him to place power at the disposal of the Clyde Valley Co. at cost price. Moreover, tenders for construction would be invited from all Imperial firms—not two only. It would also be arranged that the capital should not receive more than 8 per cent. The cost of the scheme would be approximately £200,000; the return on the capital would therefore be £16,000 per annum, as against £60,000, which, he alleged, the present Bill entailed.

Sir Charles Ross, giving evidence, said that he was willing to place his rights at the disposal of the State, or of a co-operative society, or to carry out a scheme himself, if this Bill were rejected. His figure of 0.042d. per kWh did not include capital charges. Sir Charles handed in figures which purported to show the difference in cost of the two schemes.

Mr. W. E. Tyldesley Jones, K.C., criticised these figures, stating that Sir Charles had assumed a 100-per-cent. load factor. This estimate of costs did not include a single penny for land, water rights, the cost of raising capital, and obtaining Parliamentary powers.

Mr. W. Dunn (chartered accountant) gave evidence in support of the figures put forward by Sir Charles Ross. He said that Sir Charles contemplated a 12,000- or 13,000-kW plant with an average output of 6,000 kW, so that the load factor would not be 100 per cent.

Mr. Tyldesley Jones disputed the last statement, and said that Sir Charles did not understand the figures. If the present Bill were rejected, Sir Charles would have to do exactly as the promoters had done, *i.e.*, ask the Clyde Valley Co. to take the output. It would be willing to do this, but would want to find the money and see that the works were carried out to its satisfaction.

The Committee found that the preamble of the Bill was proved.

On the following day the Committee asked for further information on certain clauses.

Mr. Tyldesley Jones said that, at the promoters' own suggestion, the time for the commencement of the scheme was reduced to two years. The promoters were prepared to reduce the time for completion to three years with an extension of two years, if necessary, subject to the approval of the Electricity Commissioners. The maximum prices at which energy could be sold by the company were 3d. per kWh up to 400 kWh, and 2d. per kWh for greater quantities. The promoters were prepared to reduce these charges to 1½d. and 1d. per kWh respectively. The period for the revision of the standard price was reduced to five years, and at the end of each succeeding five years. The company anticipated being able to supply energy at ¾d. per kWh, at which price a dividend of 16 per cent. would be permitted.

In response to a suggestion by the chairman, counsel agreed to reduce the standard price to 1d. per kWh.

Sir John Snell (chairman of the Electricity Commissioners) expressed approval of the scheme as being in the public interest.

Counsel for the promoters said that his clients would submit the construction contracts to the Commissioners for their approval.

Subject to the amendments suggested, and in view of the assurance given as to the submission of contracts to the Commissioners, the Bill was passed.

Imperial Wireless Services.—On July 29th Mr. Hartshorn informed Mr. D. G. Somerville that the Committee on Organisation of Imperial Wireless Services would not complete its work until after the recess.

"Jamming" at Sea.—On July 31st, Mr. Hartshorn informed Sir J. Nall that he was aware that considerable difficulty had been experienced by ships in receiving transmissions from the Oxford wireless station during the night time on a wavelength of 12,350 metres, which, although more efficient during the day time, was less efficient than 8,750 metres during the night. In order to obviate this difficulty arrangements had been made, on and from August 5th, to revert to the use of a wavelength of 8,750 metres for all transmissions during the night, including the 8 p.m. and midnight G.M.T. British Official news messages. The present wavelength of 12,350 metres would continue to be used for transmissions during the day.

The Proposed "Beam" Station.—On August 1st, Mr. Vernon Hartshorn (Postmaster-General), moved a resolution approving the agreement made with Marconi's Wireless Telegraph Co., Ltd., on July 28th, relating to the erection of a short-wave directional radio station for communication with the Dominions and Colonies. The terms of the contract were outlined in our last issue.

In reply to a number of questions, Mr. Hartshorn said that the agreement provided for the payment of royalties in respect of the use of Marconi patents at the rate of 6½ per cent. The Marconi Company had met the Government in a very fair manner in this matter, and it deserved recognition for the pioneer work which it had carried out. The stations had to be completed six months from the date on which sites were found for them, and the engineers of the company and the Post Office were at present considering the suitability of certain sites.

The motion was agreed to.

Tramway Employes' Wages.

Proceedings of the Special Tribunal.

As briefly reported in our last issue, the Special Tribunal appointed to arbitrate in the matter of the tramway employés' application for improved wages and conditions commenced its sittings on July 29th, when Mr. Harold Clay presented the men's case. Mr. J. B. Hamilton, speaking on behalf of the municipal authorities, said that the application, if granted, would mean an increase of as much as £2 10s. per week in some cases, to which Mr. Clay replied that the prospective recipients must be badly paid at present. Mr. Hamilton said that in the case of car cleaners at Leeds the increase would amount to £1 5s. 7d. a week; in Glasgow, on the other hand, conductors' wages would be reduced.

Mr. Spencer (for the company undertakings) asked if there were not a danger of the present application making it impossible for some undertakings to continue, to which Mr. Clay replied that the men did not agree with that view. Mr. Spencer affirmed that in consequence of recent advances some undertakings had already "gone out." Mr. Beaton (for the Scottish companies) said that some undertakings were prevented from increasing their rates to cover loss. In Scotland some undertakings had been unable to pay dividends since their inception. Mr. Clay said that some companies had cleared off in one year the deficit remaining from the previous year.

On July 30th, Mr. J. Barnard (president of the Municipal Tramways Association) produced figures showing wide variations in the income of the undertakings in the groups suggested by the employés. He said that wages were double the pre-war rate, and other expenses had increased. The alterations proposed would vary between 55.7 per cent. increase and 1.8 per cent. decrease. If wages were raised fares would have to be put up. In reply to questions, witness said that the claim was impracticable, and he did not agree with standardisation. He was not prepared to say whether the maintenance of roads by tramway authorities was fair or otherwise. The chairman (Sir W. Mackenzie) asked if it would not be possible to place all industrial centres in one group and the others in further groups. Witness replied that he did not think that four groups would be sufficient.

Further evidence from the employers' point of view was given by Mr. A. L. C. Fell, general manager of the London County Council Tramways, on July 31st. Mr. Fell said that the application affected London in two points—stabilisation and the payment of "time and a quarter" for night work. The L.C.C. tramways were in a serious position. They had incurred a loss of £160,222 last year, and a further loss of £316,276 this year was anticipated. The granting of "time and a quarter" would probably cost £59,000 annually. Owing to the variation of the sizes of the undertakings in the Metropolitan area standardisation of wages was impossible.

In reply to questions put by Mr. Ben Smith, M.P., Mr. Fell said that the total expenditure of the L.C.C. upon street widening for tramway purposes was £800,000. With regard to the reduction of fares, the Council had lost less where the fares had been lowered than where they had been kept up.

Mr. A. de Turckheim stated that the National Joint Industrial Council, of which he was joint secretary, had discussed grouping at great length, but upon coming to details agreement could not be reached. The employers wished to take averages in settling the rates for groups, whereas the employés stipulated maxima.

Mr. A. W. Chivers (British Electrical Federation, Ltd.) pointed out the advantages enjoyed by tramwaymen, instancing the provision of uniforms, free travelling, holidays with pay, and the permanent character of the work. Witness put forward cases in which motormen were receiving higher wages than men in comparable employment. The present conditions were far in advance of the pre-war conditions, even if the cost of living was taken into account.

Turning to the financial side of the industry, Mr. Chivers said that nobody would now invest in tramway undertakings at 6 per cent.; many companies were unable to meet the cost of renewals. An adverse factor was the competition of motor-'buses, which were allowed to run with unrestricted freedom.

The chairman put questions to Mr. H. Clay regarding the rates paid to women and boy workers, but Mr. Clay said that the men were only asking the Tribunal to fix adult rates at present.

The Tribunal concluded its proceedings on August 1st.

Mr. J. B. Hamilton summed up the municipal undertakers' case, and said that instead of £600,000, as suggested by Mr. Clay, the cost of conceding the application would be more nearly £750,000. If an increase of fares were attempted the public would resent it and revenue would be reduced. This left the rates as the only alternative if the extra money was to be found. The suggested increase was not justified when general rates of pay were considered.

Mr. C. J. Spencer (for the companies) contended that practically nothing had been said in support of the application for increased wages, except a very human desire for improved status. The grouping system was utterly impracticable; nothing had been said as to the difference in wages of men working on the same routes in inter-running arrangements. There was some measure of agreement upon the standardisation of rates, but when it came to details many difficulties arose. If stabilisation on the present rates would help the country the companies were willing to agree, but an advance in wages was inopportune and impossible.

Mr. Clay (for the employés) said that with regard to standardisation and grouping there had been a certain measure of agreement. The arguments against increased wages were based on inability to pay them. This was advanced in 1921, but since that time there had been a substantial reduction in wages, and the industry had also shown an improvement. He suggested that stabilisation should be put into force up to March, 1926.

At the conclusion of the evidence representatives of all parties announced that it had been agreed to recommend the National Joint Industrial Council to suspend the notice for three months in order to give the Tribunal time to come to a decision. In the meantime the present rates would be continued.

Legal.

British Thomson-Houston Litigation.

IN the Chancery Division, on July 29th, Mr. Justice Eve dismissed an application on behalf of the defendants in the action of the British Thomson-Houston Co., Ltd., against Horn & Kremenezky that the injunction granted by his Lordship should be suspended pending the result of the appeal to the House of Lords in the case of the British Thomson-Houston Co., Ltd., against the British Insulated & Helsby Cables, Ltd. In the latter case the Court of Appeal declared that the patent, called the drawn-wire patent, was invalid. His LORDSHIP said the Helsby Cables action was commenced simultaneously with the action in which this application was made, and it was idle to suppose that the defendants' advisers in this case were not acquainted more or less with the nature of the proceedings in the main action. One inferred from the attitude which the defendants took up that they deliberately decided to abide by the result of the main action and thereby avoid the great expense which would be involved in their raising in this action the issues which were going to be determined in the main action, and for reasons which one could easily appreciate they deliberately determined to limit their defence to a question of infringement. When the action came on for hearing they elected not to appear, and allowed judgment to go in default of appearance. It was not until the judgment of the Court of Appeal in the Helsby Cables case was delivered and they found that it was favourable to the defendants in that case that they endeavoured to obtain a stay of the order in this case. Even if the defendants in this case were entitled on the merits to make this application it was one that ought to have been made promptly, but it was not made till more than a month had elapsed after the judgment of the Court of Appeal. In these circumstances he must dismiss the application with costs.

In the Court of Appeal, on July 30th, before the Master of the Rolls and Lords Justices Warrington and Atkin, the British Thomson-Houston Co., Ltd., applied for orders for security for costs of appeals which had been entered by Crowther & Osborn, Ltd., and others, the Star Lamp Co., and Horn & Kremenezky from judgment entered against them at the instance of the applicants.

Mr. TREVOR WATSON said that he appeared in support of the applications. In the first case, against Crowther & Osborn, Ltd., and others, which was a patent action which dealt with plaintiffs' drawn-wire patent, the defendants were appealing from a judgment in the Chancery Division. With regard to that patent, the result of an appeal from the judgment of Mr. Justice Russell in the case of the applicants against the British Insulated & Helsby Cables, Ltd., was that the patent was held to be invalid. Since that appeal was heard and decided Crowther & Osborn, Ltd., had applied for leave to appeal from the judgment against them, notwithstanding that the time for appealing had expired, and leave to appeal was granted, and the present application was for an order against those defendants for security for the costs of that appeal.

The MASTER OF THE ROLLS: What are the costs of the appeal going to be?

Mr. WATSON: It is very difficult to say. In the Court below those defendants did not raise the issue of validity at all, and now they are appealing from the judgment. I can only suppose that when the appeal comes on for hearing the defendants will ask for a new trial, in which case they will raise the question of validity.

Mr. MORITZ, for respondents, said that he thought there ought to be a stay of proceedings until the House of Lords had given judgment upon the appeal of the British Thomson-Houston Co. from the judgment of the Court of Appeal holding its patent to be invalid. It was perfectly obvious that whatever the decision of the House of Lords might be it would be decisive of the present action. He asked that the appeal in the present case should stand over until after the judgment of the House of Lords in the other case.

In the result their LORDSHIPS said that that was the proper

course, and made an order accordingly, but it was arranged that the motion should again come before the Court on October 20th next.

Metropolitan-Vickers Electrical Co., Ltd., v. British Thomson-Houston Co., Ltd.

At the conclusion of the evidence called on behalf of the defendants in this case, Mr. Hunter Gray summed up the case on behalf of the defendants, contending that there was no subject matter in the plaintiffs' patent, and that there was complete anticipation of Rosenberg's alleged invention in Tesla's prior specification.

Sir Duncan Kerly replied on behalf of the plaintiffs. He argued that even if Tesla had Rosenberg's arrangement there was no reference in his specification to the necessity for getting into step, apart from speed. He said that Tesla thought so little, if he ever thought at all, of the necessity of putting the machine into synchronism before switching on the full load current, that he had never referred to it in his specification, and it was clear that what he had done was to put the full load current on to an electrically dead machine. The further hearing was adjourned until a day to be fixed next sittings.

Whitchurch and District (Hants.) Gas Co., Ltd.

The petition presented by this company asking the Court to confirm an alteration of the provisions of its memorandum of association to enable it to supply electricity, as well as gas, is to be heard by Mr. Justice P. O. Lawrence on October 17th.

Breach of Electricity Regulations.

On July 29th, Messrs. F. W. Berk & Co., Ltd., chemical manufacturers, West Ham, were summoned at the West Ham Police Court for a breach of the Electricity Regulations for Factories and Workshops. Mr. R. V. Shaxby, inspector of factories, stated that a man was killed at defendants' works on June 28th owing to his falling and coming into contact with an electric wire. It was discovered that the wire had been jointed and the joint had merely been wrapped with insulating tape. The pressure was 200-V a.c. For the defence it was stated that the deceased man had acted against instructions in mounting a machine to replace a belt.

The magistrate imposed a fine of 90 guineas, and 5 guineas costs.

Published Specifications.

Compiled expressly for this journal by Patent Agents.
The name of the applicant's patent agent, if any, will be found on the printed specification.
The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1923.

793. "Lighting fixtures." A. H. Stevens (administrator of J. Doyle (deceased)). January 9th, 1923. (218,091.)

1,472. "Electric circuit controlling means." R. Peale, Senr., R. Peale, and R. Peale, Junr. January 16th, 1923. (218,696.)

6,378. "Electric motor starters." J. A. Hirst and Brook, Hirst & Co., Ltd. March 6th, 1923. (218,702.)

7,258. "Heating elements for electric rotating resistance furnaces for treating zinc powder." Finspongs Metallverks Aktiebolag. March 29th, 1922. (195,610.)

9,596. "Telephone systems." Relay Automatic Telephone Co., Ltd., W. D. Edwards, and R. G. Vanneck. April 7th, 1923. (218,722.)

9,695. "Systems for producing electrical oscillations." British Thomson-Houston Co., Ltd. April 10th, 1922. (195,987.)

9,804. "Magneto-electric machines." British Thomson-Houston Co., Ltd., A. P. Young, and E. G. Parrott. April 10th, 1923. (218,739.)

9,805. "Wireless signalling systems." British Thomson-Houston Co., Ltd. April 10th, 1922. (195,990.)

9,810. "Temperature-controlling devices for electrical heating appliances." B. R. Wingfield. April 10th, 1923. (218,740.)

9,885. "Telephone receivers, loud-speaking telephones, and the like sound-emitting devices." British Thomson-Houston Co., Ltd., and A. P. Young. April 11th, 1923. (218,743.)

9,954. "Electric circuit breakers and the like." A. Reyrolle & Co., Ltd., and B. H. Leeson. April 12th, 1923. (218,746.)

10,031. "Liquid controllers for two- and three-phase slip-ring motors." A West & Co., Ltd., and A. West. April 12th, 1923. (218,749.)

10,113. "Loud speakers for use in wireless telephony." Johnson and Phillips, Ltd., and W. H. Johns. April 13th, 1923. (218,753.)

10,439. "Automatic reclosing circuit-breaker systems." British Thomson-Houston Co., Ltd. May 12th, 1922. (197,662.)

10,572. "Apparatus for transmitting electrically scenes or representations to a distance." W. S. Stephenson and G. W. Walton. April 18th, 1923. (218,766.)

10,642. "Trucks for vehicles adapted to run on rails, such as electric tramcars and the like." P. Priestly. April 19th, 1923. (Cognate application, 30,262/23.) (218,767.)

10,979. "Sparking plugs." A. E. Heath. April 23rd, 1923. (Cognate application, 27,439/23.) (218,772.)

11,837. "Construction of thermionic valves." A. P. Portway. May 2nd, 1923. (218,784.)

12,029. "Electric switch plates." Walsall Hardware Manufacturing Co., Ltd., A. E. Reed, and A. E. Millard. May 4th, 1923. (218,786.)

12,182. "Electric transmission systems." A. M. Taylor. May 7th, 1923. (Addition to 217,342.) (218,787.)

12,316. "Automatic switching arrangements for telephone exchanges and the like." Coventry Automatic Telephones, Ltd., and J. E. Collyer. May 8th, 1923. (218,789.)

13,563. "Traffic signals for road vehicles." F. F. Race. May 22nd, 1923. (218,801.)

13,739. "Electric motor control systems." A. H. Jackson. May 24th, 1923. (218,803.)

15,765. "Sound-distributing device for use with telephone receivers." A B. Johanning. June 18th, 1923. (218,821.)

16,147. "Electric discharge tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. June 21st, 1922. (199,732.)

16,374. "Impedance bonds for use in railway signalling systems." Automatic Telephone Manufacturing Co., P. N. Roseby, and A. E. Hudd. June 23rd, 1923. (218,826.)

16,476. "Amplifiers." British Thomson-Houston Co., Ltd. June 26th, 1922. (199,742.)

16,692. "Ignition control switches on internal-combustion engines." J. G. P. Thomas and Thomas Inventions Development Co., Ltd. June 27th, 1923. (218,828.)

17,683. "Portable electric lamps for mining and other purposes." I. S. Mackenzie, A. Abell, and J. Davis & Son (Derby), Ltd. July 7th, 1923. (218,841.)

18,649. "Automatic electric sub-station control equipments." British Thomson-Houston Co., Ltd. September 15th, 1922. (204,019.)

15,485. "Manufacture of alloys containing tungsten carbide." General Electric Co., Ltd. March 29th, 1923. (213,524.)

19,732. "Illuminating appliances." W. A. Dorey. June 12th, 1923. (217,539.)

20,020. "Dynamo-electric machines." Bosch Akt. Ges., R. August 12th, 1922. (202,304.)

20,099. "Air-brake dynamometers." Armstrong Siddeley Motors, Ltd., F. R. Smith, and B. W. Shilton. August 7th, 1923. (218,859.)

20,499. "Sound-reproducing devices applicable also for recording telegraphic signals." S. Calamatianos. February 26th, 1923. (211,826.)

20,637. "Starters or controllers for electric motors." Electric Control, Ltd., and O. Ellefsen. August 14th, 1923. (218,866.)

20,770. "Thermostats." W. E. Ernst. August 15th, 1922. (202,640.)

21,176. "Distribution and reception of electrically-transmitted sounds and signals." E. Bertron. August 28th, 1922. (202,989.)

24,032. "Electrical testing device." Fournier et Cie. October 3rd, 1922. (205,068.)

25,958. "Anti-glare devices for motor and other lamps and the like." E. Gowland. October 17th, 1923. (218,894.)

27,045. "Stopping devices for electric motors." H. V. James. October 29th, 1923. (218,900.)

28,067. "Devices for counting electrical or mechanical impulses." M. B. Richter. November 7th, 1923. (218,905.)

28,263. "Electric switches." Fabrik Elektrischer Apparate F. Sauter Akt. Ges. November 10th, 1922. (206,849.)

29,094. "Electromagnetic cut-outs." R. Haddan (A. Huni). November 17th, 1923. (218,909.)

29,490. "Arrangement for starting cascade groups of electrical machines." Ateliers de Constructions Electriques de Charleroi, Soc. Anon. October 13th, 1923. (Addition to 15,875/13.) (218,912.)

30,845. "Electric transformers." British Thomson-Houston Co., Ltd. (General Electric Co.). December 7th, 1923. (218,918.)

31,648. "Time-control mechanism for electric switch control apparatus." H. V. James. December 17th, 1923. (218,922.)

32,436. "Electric motor and like controllers." Sunderland Forge and Engineering Co., Ltd., and W. Blair. December 28th, 1923. (218,927.)

1924.

2,358. "Protective device for an alternating-current system." British Thomson-Houston Co., Ltd. (General Electric Co.). January 29th, 1924. (218,938.)

3,188. "Electromechanical devices particularly for use in clocks and the like." L. Delorme. February 8th, 1923. (211,139.)

3,734. "Process for manufacturing roofing elements by electrolysis." Anaconda Sales Co. February 17th, 1923. (211,478.)

4,304. "Electric switches." British Thomson-Houston Co., Ltd. March 2nd, 1923. (212,240.)

5,152. "Compensators for railway signalling apparatus." A. G. Kershaw and Westinghouse Brake and Saxby Signal Co., Ltd. July 13th, 1923. (218,954.)

7,851. "Portable electric lamps." J. E. Bufton. March 27th, 1924. (218,957.)

12,524. "High-frequency alternators." N. Oboukhoff. April 16th, 1923. (Divided application on 10,345/23.) (218,962.)

The Röntgen Society.—The annual report of the Council for the year ended December, 1923, shows that eight meetings were held during the session. The statement of accounts shows that the year closed with a surplus of income over expenditure of £102, the gross income of the Society, £920, being about the same for the last two years. The Council's award to commemorate the work of the late Prof. Röntgen has been fixed at £10 (or the equivalent in books or apparatus), and will be presented to the member whose contributions during the session are of sufficient distinction. The journal of the Society has this year assumed a new title, namely the *British Journal of Radiology*, Röntgen Society Section, incorporating the *Journal* of the Röntgen Society, which is the outcome of negotiations between the Society and the British Association for the Advancement of Radiology and Physiotherapy, with a view to close working. A joint editorial committee will advise on the conducting of the two journals.

Portable Power Plant for Mines.—On May 5th, the Mancha power truck was approved by the Department of the Interior, U.S.A., for safe use in gaseous and dusty coal mines. The truck is the first portable power plant to be approved for underground use in mines with an explosion hazard and is used for operating coal-cutting machines; it is unique in that it works on a storage battery, thereby eliminating the need of an electric feeder circuit to the coal face. "This is important because sparking from the electric wiring is one of the chief sources of electrical accidents in mines." A wider application of the storage battery may eventually do away with the need for trolley wires in gassy mines, say the *Journal* of the Franklin Institute.